FLIGHT

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER.

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport.

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CONTENTS.

EDITORIAL COMMENT.

The Aeroplane in War. A New Phase.

We have come to accept the aeroplane as being an essential part of the equipment of a modern army in the field, but hitherto the discussion as to its actual and potential uses has been confined entirely to the combatant side of war. That is to say, authorities and experts have agreed, for example, that for reconnaissance work aircraft are indispensable, the only problem connected with this side of their work being the exact limitations of their work in the face of hostile craft, and their precise value to a commander who is operating in close country. On the question of the actual combatant value of the aeroplane—that is, its use for purposes of aggression—the views are more diverse, and much interesting discussion has eventuated between the two schools of military thought, the one which holds that the use of aircraft will be entirely restricted to scouting and reconnaissance generally, and the other which attaches distinct aggressive value to the aeroplane and the dirigible.

It has remained for Lieut.-Col. Donegan, of the Royal Army Medical Corps, to call attention to the possibilities of aircraft for medical service in time of war. In the course of a lecture at the United Service Institution last week, he described a portable surgical equipment, invented and arranged by himself, for use in connection with aeroplanes and medical field service. The equipment consists of a collapsible operating table, which can also be utilised as a bed and a stretcher, and enough surgical material for fifteen or twenty operations. The table has a heating arrangement, and is practically unbreakable, while the whole equipment weighs about 90 pounds. Col. Donegan estimates that a modern military biplane could convey it, with three medical assistants in addition to the pilot to any part of the battlefield at which it might be needed.

Discussing the whole question of the use of aircraft by the medical department of an army in the field, Col. Donegan said that in many instances a captive balloon, suitably marked, would indicate the position of the field hospital far better than flags. Airships would be useful for swiftly conveying certain classes of patients to a base hospital. Aeroplanes would not be as useful for this duty, but he foretold that in the wars of the future, when the aeroplanes of an army had carried out their work of scouting and the main engagement had commenced, they would be placed at the disposal of the medical corps. They could go out and scout for wounded, and would bring information to the officer commanding, which would enable him to decide, without guesswork, where and in what numbers his staff was needed. They could bring specialists from headquarters or the nearest city, and, if necessary, they could convey a wounded man in one hour a greater distance than he could be transported in four days by ordinary field service means. Aeroplanes could save an enormous amount of communication by heliograph or wireless, as the commanding officer could travel swiftly to any given place at any moment, and see what the position was with his own eyes.

Aeroplanes for military purposes would probably grow in size and power, as the last French manœuvres had demonstrated that three observation officers were needed, in addition to the pilot, to study cavalry, infantry and artillery dispositions respectively, and when the necessary aircraft were off military duty the three vacant places would be filled by the three surgical assistants, plus the portable equipment.

We have no comment of our own to offer, save that Col. Donegan's lecture, interesting as it is from the purely technical point of view relating to the treatment and removal of the wounded on the field of battle, becomes doubly so when it is regarded as yet another instance of how entirely commonplace dynamic flight has become in these latter days. At the risk of becoming hackneyed, we cannot refrain from saying that it is all very wonderful how the thing has become so much of an accepted fact, when we reflect that not ten years ago the man who prophesied that we should ever fly at all would have been regarded as well qualified for a lunatic asylum.

It is significant, too, that Col. Donegan's military audience had no word of criticism to offer upon the possibility of utilizing the aeroplane in the manner suggested. Apparently, they were content to accept the entire feasibility of the idea. Brig.-Gen. Stone certainly thought that Col. Donegan was unduly sanguine as to the availability of a sufficient number of machines for carrying out the work outlined. He suggested that the medical service should be supplied with such a number of aeroplanes as might be necessary, and that they should form part of the Army establishment. Lieut.-Gen. Bethune, who presided, agreed that the lecturer had made out a good case for his proposals, and in order that they might be efficiently carried out, he thought that a sufficient number of suitable machines ought to be provided and earmarked for the purpose. Not a word, it will be seen, as to the physical possibility of carrying out the work on the suggested lines. That anything will be done yet, it would be too much to hope—we must first get enough machines for our combatant needs—but it is quite clear that the uses of aircraft in war have by no means been exhausted in the discussions that have turned about them.

Aircraft and Wireless.

It has been an open secret that Mr. Marconi has been carefully studying a system of transmitting wireless messages from aeroplanes. It is therefore gratifying to learn that he has made such progress that experiments are shortly to be carried out at Hendon which will demonstrate the degree of success obtained. At present this branch of wireless telegraphy has not progressed much beyond the elementary stage, but the increasing range of the aeroplane has made an improved system essential, and it is anticipated that Mr. Marconi, who has made several flights with Mr. Hamel, will evolve apparatus which will meet the demands of the naval and military authorities.

Very little has been heard as to the details of wireless experiments which have been carried out on the Continent, though it is understood that the French naval authorities have met with a very fair measure of success both in the transmission and receiving of wireless messages by aircraft, and particularly by aeroplanes. Nor have we heard much more of the experimental work which we have reason to believe has been in course of execution on this side of the Channel, and, in the light of the above information, it would seem that the reason is because there has been nothing to tell. In other words, the measure of success attained has not been such as to encourage the experimenters to talk about it. That the difficulties will be solved we have no manner of doubt, and once they have been overcome it is manifest that the usefulness of the aeroplane, particularly for military and naval work, will be very greatly extended. In fact, a really reliable wireless installation suitable for such work would increase the value of scouting aircraft out of all knowledge.

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THE PASHLEY BROTHERS.

PILOTS.

THE first acquaintance of the Pashley brothers with practical aviation dates back to May, 1909, when they commenced experimenting with a glider. Some time after that their ambition for something a little more exciting was met by a 25 h.p. Anzani-Blériot on which Cecil Pashley made several excellent flights, while Eric at his first attempt flew the length of Brooklands aerodrome at a height of 30 ft. In January, 1911, they did some flying on a Lane monoplane, and later, on joining the Universal Aviation Co., a lot of work was carried out on a Sommer biplane, on which Cecil qualified for his *brevet* in July and Eric in September, the qualifying flights being made at Brooklands. Then some good results were obtained with a Humber monoplane until July, 1912, when the Sommer biplane was reverted to, and on this several of the week-end races were secured. In January, 1913, Eric Pashley was starting on a cross-country flight to Shoreham, when ensued the collision with another machine which led to the historic case in the High Courts which was reported in FLIGHT a week or two back. In the following May, having transferred their headquarters to Shoreham, both brothers commenced flying a Henry Farman, and their activities during the season included some tours by air, embracing visits to a large number of towns in the South of England, the aggregate distance traversed being very little short of 10,000 miles. It will be remembered that several photographs taken from the Pashleys' Farman machine by Mr. Clarence Winchester have been reproduced in these pages. Unfortunately Eric Pashley was involved in a motor cycle accident in August last which necessitated being laid up for some time, but he has since recovered, and is able to pilot the machine again. Whenever the weather is not too bad, either one or the other of the brothers may be seen flying the Farman 'bus at Shoreham, from which place they often make cross-country trips with passengers.

THE HAWK.

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French Military Pilots' Certificates.

SEVERAL modifications have recently been made in the regulations governing the issue of the French military or "superior" pilot's certificate which may be secured by civilian pilots through the Aero Club of France. Candidates must produce a certificate showing that they have fulfilled their obligations regarding military service, and they must pass an examination in map reading, meteorology, construction and regulation of aeroplanes, and the working of motors. They will also have to make certain practical tests in the air. 1. A flight lasting more than an hour, the altitude during this time to be at least 1,000 metres, and not more than 1,200 metres. 2. Make a *vol plané* landing with motor stopped from a height of 500 metres above the ground, the machine to land not more than 200 metres from the spot indicated in advance, and without the motor being switched on again. 3. Three cross-country flights, the first a triangular one of 200 kiloms. (the shortest side of the course to be more than 20 kiloms.) with two stops at predetermined points, the flight to be made on one machine and in a maximum time of 48 hours.

The second and third flights will be of 150 kiloms. in a straight line, one to be made non-stop and the other to be made between sunrise and sunset with a stop indicated in advance.

MEN OF MOMENT IN THE WORLD OF FLIGHT.

THE PASHLEY BROTHERS—ERIC AND CECIL.

GRAVITY CONTROLLED VELOMETERS.

Two main kinds of instrument are used for indicating the speed of an aeroplane through the air. Both depend on the dynamic pressure of the air acting on some part of the instrument, but they differ in the nature of the opposing force. When this control is by springs or their equivalent we may call the instrument an air speed indicator, and when gravity is the controlling force the term velometer may be used.

These appliances are distinct and are useful for different purposes. The spring controlled air speed indicator will tell the true air speed at any moment, and when it is desired to know this, as for instance for purposes of scientific investigation, it should be used. It also has the advantage of not depending on a liquid gauge, so that it is perhaps easier to make fool proof.

The velometer, on the other hand, does not tell the true air speed at any moment, but it does give definite information as to safety, warning the pilot if he is in danger of over-stepping the limits of control of his machine.

It is suggested that some confusion between the two objects exists in the article in FLIGHT of January 3rd, entitled "A Warning to Pilots," since in that article pilots are warned against the very peculiarity which makes for safety in the velometer type of instrument. This would have been clear if Mr. Booth had carried his argument a little further in the above article.

Mr. Booth showed, quite rightly, that since the apparent weight of objects on an aeroplane is affected by any up or down acceleration of the aeroplane, therefore the apparent weight of the liquid in the gauge is so affected. This was, I think, pointed out by Mr. Horace Darwin last year in his paper before the Aeronautical Society. The result is that the velometer does not always read the true air speed. Here Mr. Booth's argument stops. Let us carry it a little further and consider, firstly, what it is that a practical flyer should be informed of so that he can fly safely, and, secondly, what it is that the velometer tells him.

It will then be plain that the two are the same, and that the velometer tells him exactly what he wants to know.

The argument following may be summarized by saying that gravity is our enemy on an aeroplane, and air speed is our friend, and the velometer, by balancing gravity against air speed, shows us whether friend or foe is the stronger.

In Mr. Booth's first paragraph he mentions that the velometer is used as a safeguard against stalling.

The term "stalling" denotes the condition of affairs when the wings have reached a certain large angle of incidence. Beyond this angle, which is different for different wing shapes, the form of the air-flow round the wing changes, and a dead air region forms above the wings. The results of this are :—

(1) The lift falls suddenly, and a further increase of angle of incidence reduces the lift still more.

(2) The drift of the wing is increased considerably.

These cause the machine to be uncontrollable, (1) causing the ordinary warping motion to have an effect in the opposite direction to that expected, and (2) causing the aeroplane to further lose speed, so that an unusually prolonged dive is necessary before the ordinary speed is regained.

The above effects must be familiar to all pilots and students of flight, and I merely recapitulate them to point out that the cause of the trouble is in the largeness of the angle of incidence, and only incidentally the smallness of the speed. Such uncontrollability is bound to result, whatever the speed, if only the angle of incidence is made large enough.

It is, therefore, of excessive angle of incidence that flyers require to be warned.

Let us now further consider what are the exact conditions under which excessive angle of incidence occurs.

The lift produced by the wings is, in flight, always equal to the apparent weight of the aeroplane.

The latter is the sum of the components perpendicular to the wings of (a) the actual weight plus (b) the force necessary for any acceleration that the machine is performing, as, for instance, the centrifugal force during a banked turn, When the angle of incidence is nearly as great as the critical angle, the planes have reached their maximum lift coefficient. The lift which occurs then cannot be increased without increasing the speed, and it (*i.e.*, the lift at the critical angle) is equal to a quantity which varies as the square of the speed. As long as the apparent weight of the aeroplane is less than this quantity, so long will the lift coefficient be less than the maximum, and the angle of incidence less than its critical value.

To put it more exactly, the maximum lift is equal to : (maximum lift coefficient) $\times$ (area of planes) $\times$ (ρ, the density of air) $\times$ (speed)^2.

The first two terms are constants, so we see that for safety it is necessary that : (apparent weight of aeroplane) $<$ (a constant) $\times$ ρ $\times$ (speed)^2.

Turn now to the velometer and consider what it shows. This instrument balances a pressure due to the speed through the air against the apparent weight of a column of liquid.

The pressure received from the pressure head is equal to : (a constant) $\times$ ρ $\times$ (speed)^2.

The apparent weight of the column of liquid is proportional to the apparent weight of everything else in the aeroplane, and therefore, of course, to the apparent weight of the aeroplane itself.

The velometer, therefore, shows us the relation of (apparent weight of aeroplane) to (a constant) $\times$ ρ $\times$ (speed)^2. And this is what the flyer wants to know, as has been shown above.

The two constants must, in practice of course, be calculated, and so the minimum reading for safety determined. This will be equal to the minimum safe speed reading, which one knows for any given aeroplane in terms of miles per hour for straight flight.

It has now been shown that the velometer may be relied on as a safety indicator whether flying straight or doing banked turns, sudden dives or flattening out.

Even with the velometer, however, there are times when full protection is not afforded, and it is for these times that a "warning to flyers" may be useful.

Thus a reading which is only just safe when flying straight may not be quite safe when turning. This is because it may be necessary to warp or bring the dihedral angle into effect, and both these increase the angle of incidence of part of the wing, and the flyer is not safe if any part of the wing exceeds the critical angle.

It will, therefore, be advisable always to have a good margin, and especially when turning.

Again, in the matter of turns, it must be remembered that the velometer is only a guide which asserts that the

controls will work (*i.e.*, that the critical angle has not been exceeded). It must be remembered that as the speed is greater than that registered by the velometer, so the centrifugal force is greater, and the total force on the wings is correspondingly increased. A lift accelerometer would be the best indicator to give warning of the overloading of the wings which accompanies too sharp a turn. This instrument has only up to now been used in an aeroplane for research, and has not so far been used as a permanent fitting, and in default of this the velometer and angle of bank must be watched.

With regard to Mr. Booth's reference to gusts, it is a matter of experience that most gusts are so local that the greater part of the acceleration is over before any correcting can be done. In turbulent air it is usually sufficient to see that the mean reading of the velometer is above the safe minimum.

I fear that Mr. Booth's "second test" will be found a failure. No flyer could fail to notice the fierce fluctuations which are produced in an undamped velometer in a gusty wind. Mr. Booth would of course be right if every gust attacked every part of the aeroplane with equal intensity at the same instant and exactly in the direction of its travel. The turbulent motion of the wind is, however, very different from this. Gusts in every direction attack sometimes one part of the aeroplane, sometimes another. At one moment a local head gust affecting only the pressure tube and the part of the wing near it will send the liquid up in the gauge and merely lift one wing a little. At the next, perhaps, an up gust will envelop the whole aeroplane, raising it with a sudden jerk, and leaving the liquid to fall far down in the tube owing to the temporary increase of apparent gravity. The fluctuations of an undamped instrument are, in fact, so great that considerable damping is usually necessary for ease of reading.

When the aeroplane enters an extensive and strong up current, it may be necessary to use the elevator to keep a safe reading, but the effects of most up gusts are so temporary that even if they cause the critical angle to be reached, no harm is done, so far as experience extends, *i.e.* with winds in which the maximum readings have reached 55 m.p.h., at the R.A.F. Observatory, at Pyestock.

In the editorial remarks on Mr. Booth's article, it is to be observed that an ordinary U tube is referred to. Acceleration or tilting of this in its own plane will of course introduce a grave zero error. This difficulty has been overcome by Mr. F. Short's velometer, now used as a standard in the Army (and made by Messrs. Elliott Bros., Central Buildings, Westminster, and Messrs. Casella and Co., of 11, Rochester Row, Victoria Street. The method adopted is to split one limb of the U into two, putting half of it on each side of the other limb, thus: ɯ. The two outer limbs are connected together at the top and both connected to the Pitot tube.

Before leaving the subject, I should like to point out one more consideration which may have escaped the notice of scientists less experienced than Mr. Booth.

In the matter of high flying it is necessary to go faster as the air gets thinner. This is allowed for on all air speed indicators as well as in the velometer, by the fact that the density of the air is one of the factors determining the reading. It will therefore be safe if pilots keep the instrumental reading above the known minimum safe reading. They will be travelling faster than when near the ground, but the angle of incidence will be the same. In conclusion, the above considerations will, it is hoped, show that there is no occasion for that vague distrust of the velometer which Mr. Booth attributes to pilots. As long as the instrument and its connections are kept free from leaks and obstructions, so long may it be relied upon. And it is found that a short experience of its use convinces pilots of its value.

E. T. BUSK, A.F.Ae.S.

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Mr. Frank McClean's Progress along the Nile.

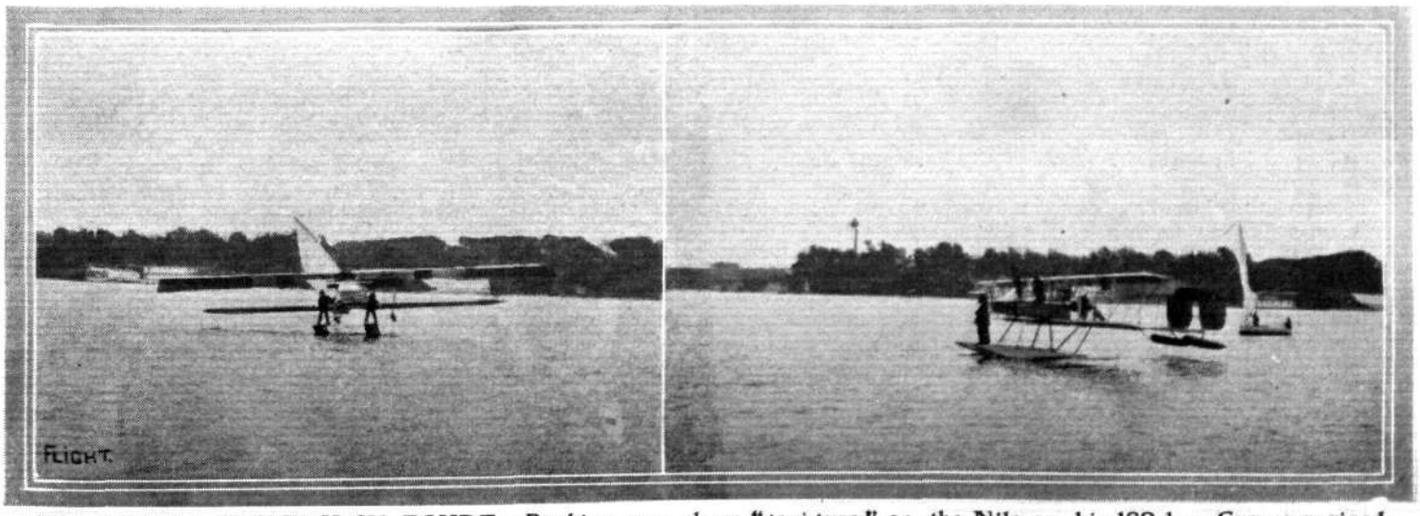
ON the 16th inst. Mr. McClean arrived on his Short waterplane at Luxor, and later went on to Assuan, while two days later he made some flights to the delight of the great crowd which had gathered to see the machine. On Monday he started to continue his flight south to Khartoum, but after flying about 130 miles had to return to Assuan, owing to trouble with the motor. He has had very bad luck with his motor, and had to spend several days at Assiut on account of a broken ball race which distributed itself in the crankcase.

Bonnier at Alexandria.

ON his Nieuport monoplane, and accompanied by his passenger, Bonnier, on the 14th inst., flew from Cairo to Alexandria in 2 hours 20 mins.

Marc Pourpe in Egypt.

WITH the intention of making a sight-seeing tour through Egypt, Pourpe left Khartoum on his Morane-Saulnier monoplane on Monday. He arrived at Atbara 4 hrs. 10 mins. later and stayed there for the day. The next day he went on to Abu Hamed, a trip of 2 hrs. 20 mins.



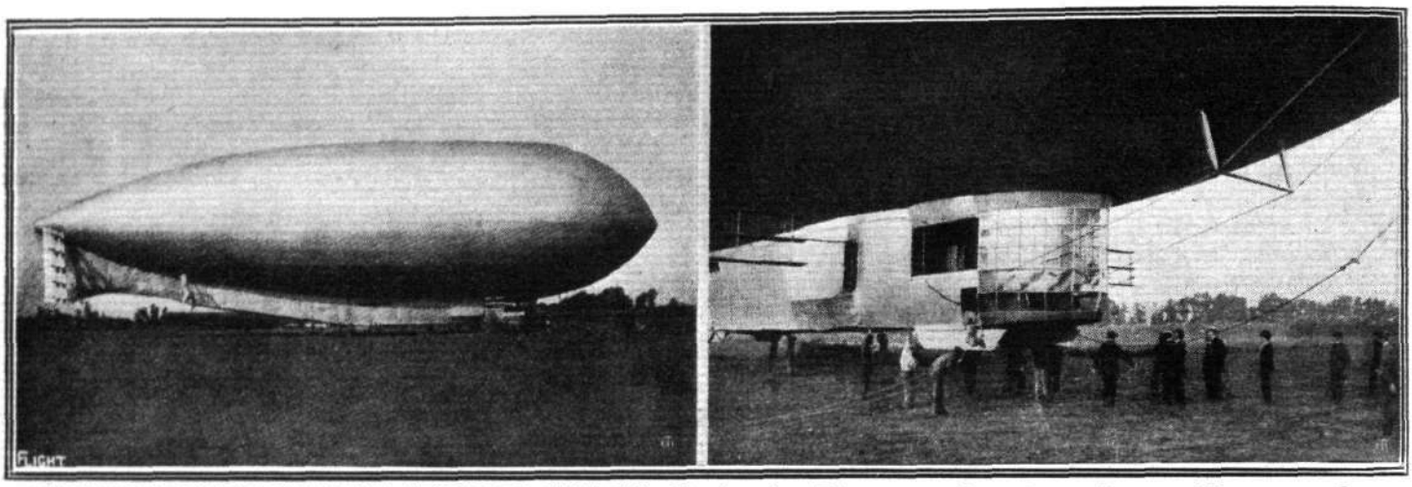
MR. FRANK McCLEAN IN EGYPT.—Banking on a sharp "taxi-turn" on the Nile on his 160 h.p. Gnome-engined Short waterplane.

THE FORLANINI AIRSHIP.

IN view of the announcement that the Admiralty has ordered from Messrs. Armstrong, Whitworth and Co. a semi-rigid airship of the Forlanini type, the pictures and details of the system developed by the Italian engineer Forlanini, as exemplified in the airship "City of Milan," are of interest. This vessel made several trial trips in the neighbourhood of Milan last August, and during one of them Capt. Murray Sueter, R.N., of the Admiralty Air Department, was included among the passengers.

With a view to ensuring that the envelope maintains its proper shape, because of the high speed of which the "City of Milan" is capable, the car is directly attached to the rigid framework which forms the bottom of the envelope, to which are also fixed the supports for the propellers and the control planes.

The elevating surfaces are in duplicate, the front ones being arranged in three superimposed planes, and the rear set forming a grid with the rudders at the extreme rear. Besides acting as

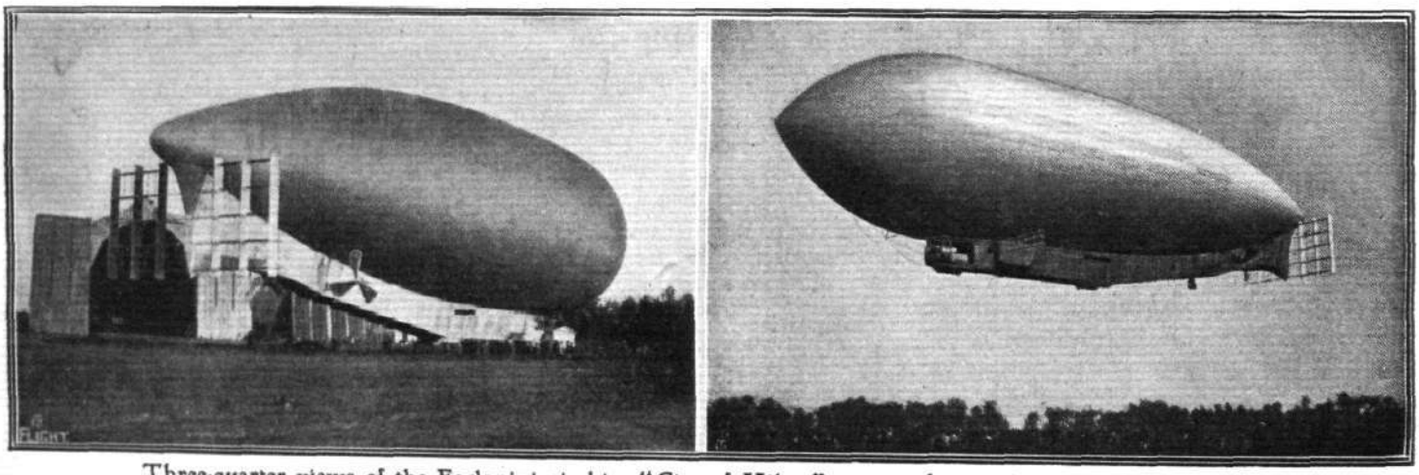


THE FORLANINI DIRIGIBLE, "CITY OF MILAN."—Her length is 72 metres and maximum diameter 18 metres. On the right is seen the observation cabin in front, the forward elevating planes and ventilators.

The general design of this latest Forlanini airship is similar to the original one called the "Leonardo da Vinci," which made her first ascent in July, 1909, but the envelope is nearly twice as long, while the diameter has not been increased very much. The actual length is 72 metres, while the maximum diameter is 18 metres, so that the ratio of maximum diameter to length is 1 to 4. The capacity of the envelope is 12,000 cubic metres.

Instead of occupying the usual position at the bottom of the envelope, the air-chamber of the "City of Milan," which compensates for the loss of gas, conforms to the shape o. the envelope; it communicates with the external air by means of apertures in the car, to be seen behind the pilot's cabin and beneath the forward elevating planes. It is provided with two fans, one of comparatively large power for use when the airship is at rest, and the other of less power for use when the airship is in motion, at such times as the compensation of the interior pressure is not already provided by the relative wind.

stabilisers—there being no fixed empennage—a certain amount of dynamic support is derived from them when the airship is in motion. The car, which occupies more than a third of the length of the envelope, is very large. In the front part, protected by mica and cellon windows, is the pilot's cabin, capable of accommodating a large crew, in which are situated the control levers, and a neatly arranged and very complete set of observation instruments. The rudder control is in the centre, whilst the elevator control is on the pilot's left.



Three-quarter views of the Forlanini airship, "City of Milan," as seen from behind and from in front.

The controls are worked by motor or by hand, the change from one to the other being effected by a simple clutch mechanism. The grouping of the control levers is such that they can be operated by one man.

In the middle part of the car are the two water-cooled motors of 80–85 h.p. each, which work conjointly or independently. The two wooden propellers have a diameter of 4·2 metres, and a pitch of 6 metres.

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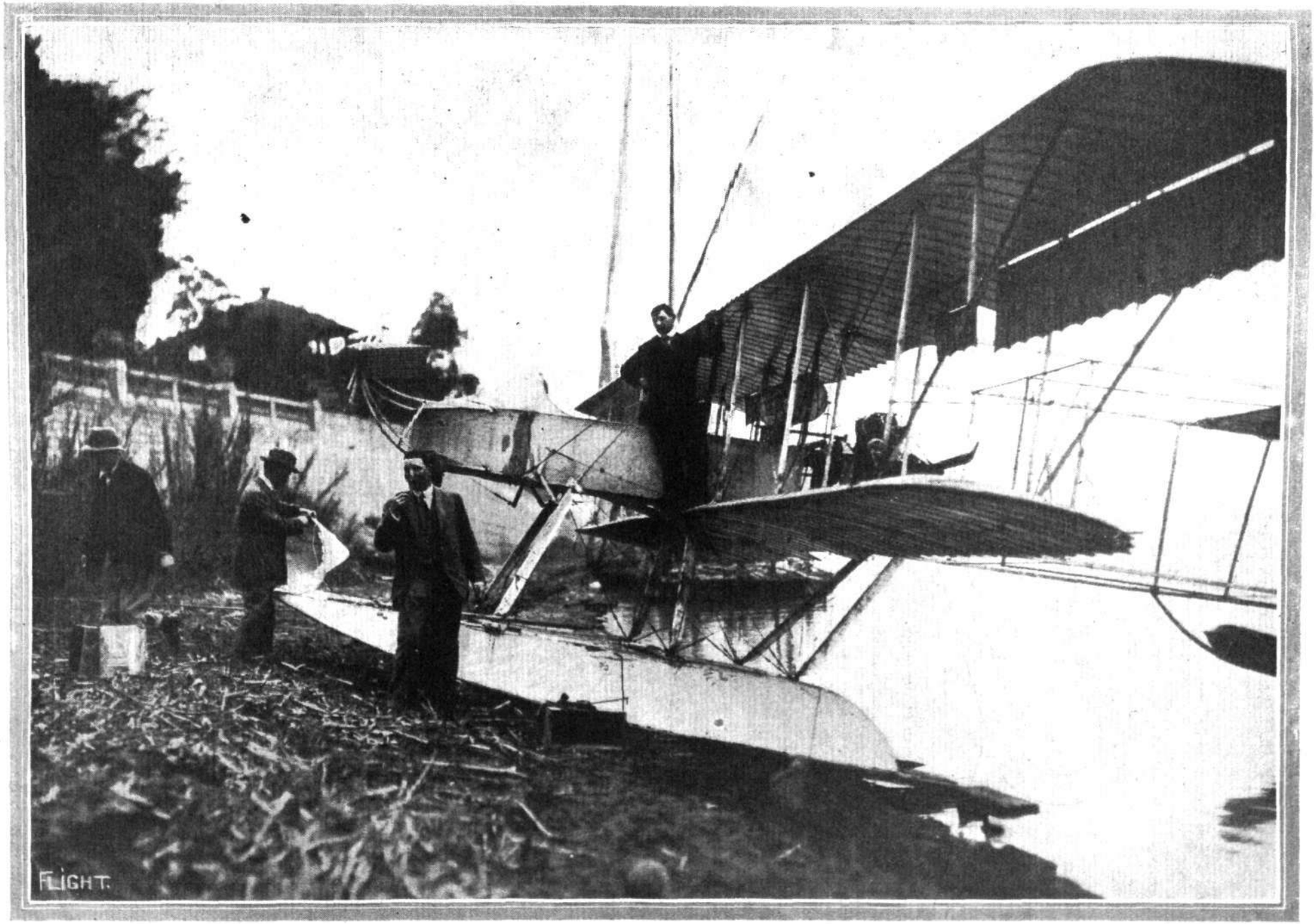
The Spiess Airship over Paris.

ON the 16th inst., the French rigid dirigible "Spiess" with nine persons on board, made a trial trip above Paris. Leaving St. Cyr a few minutes after two, she passed above Puteaux and then followed the course of the Seine through the French capital, being manœuvred above the Government buildings on the way. She returned to her hangar at St. Cyr at four o'clock.

Seventeen-Hour Voyage by "Adjudant Vincenot."

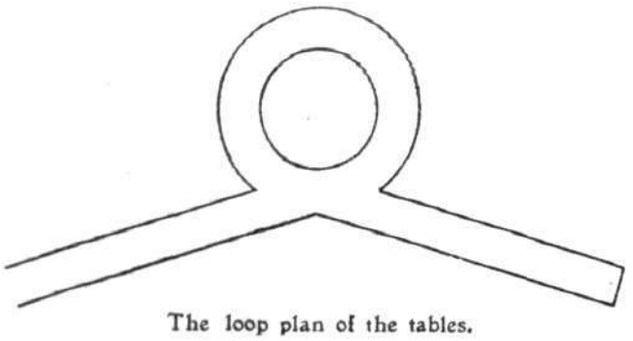
LEAVING her hangar at Issy at 5.15 p.m. on the 16th inst., the dirigible "Adjudant Vincenot" was steered to Verdun and back without a stop, the journey taking over 17 hours, and the headquarters at Issy being regained at 11.20 a.m. on Saturday morning. The dirigible carried eight persons, and several times was in wireless communication with the Eiffel Tower.



MR. FRANK McCLEAN AND HIS SHORT WATERPLANE AT CAIRO.—Mr. Frank McClean is seen standing on the ground in the centre of the picture without a hat on, the photograph being taken just prior to Mr. McClean's flight to Assiut.

THE "UPSIDE-DOWN" DINNER.

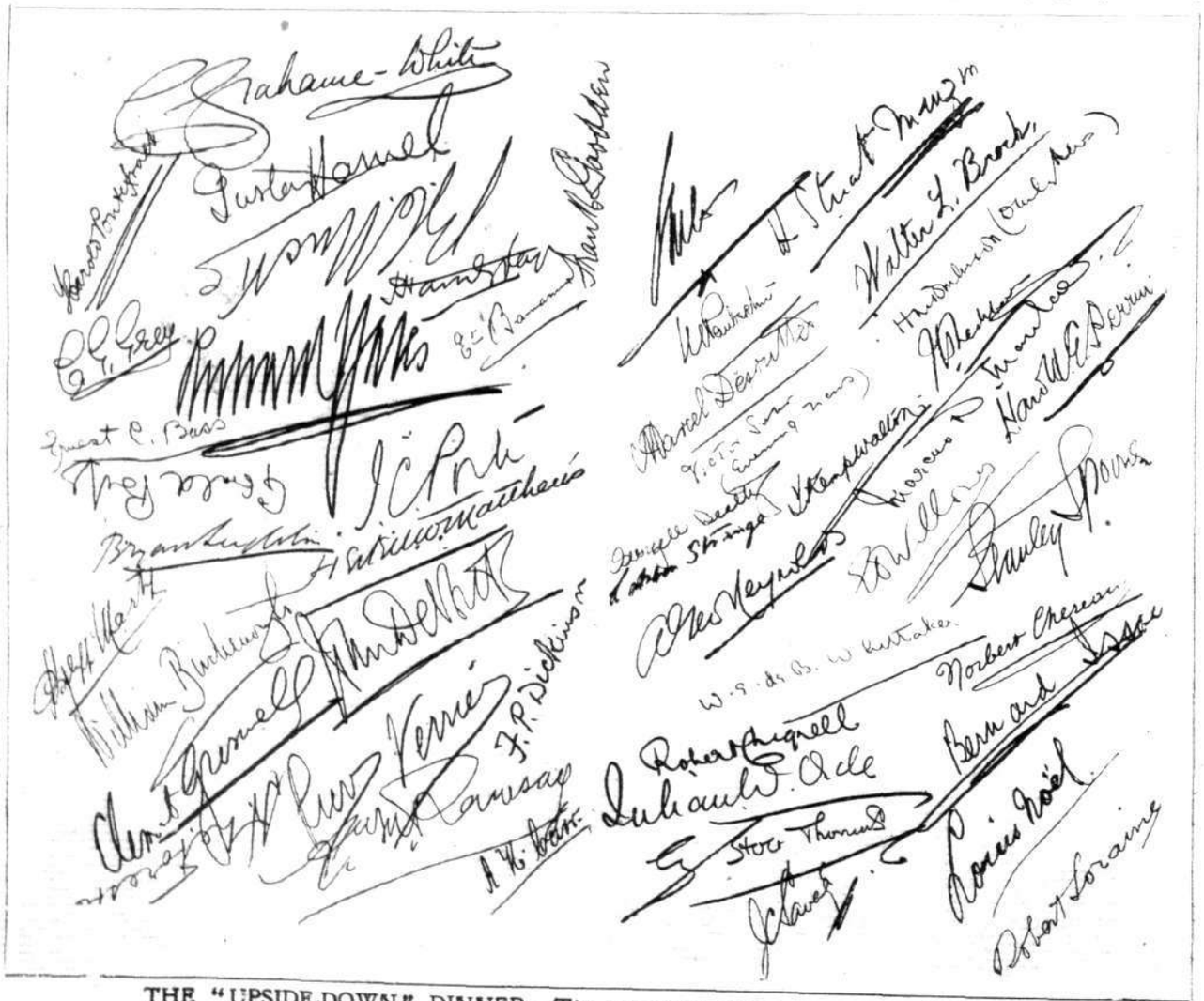
WHEN the announcement was made of the holding of an upside-down dinner in honour of Mr. B. C. Hucks and Mr. Gustav Hamel by the Hendon aviators, much fun instantly suggested itself to the average mind, and those who were fortunate enough to attend were not disappointed. The function, which took place at the Royal Automobile Club on Friday night of last week, was further unique from the fact that it was attended only by those intimately associated with aviation, and a jollier and more thoroughly amusing evening could hardly be spent than that in which the



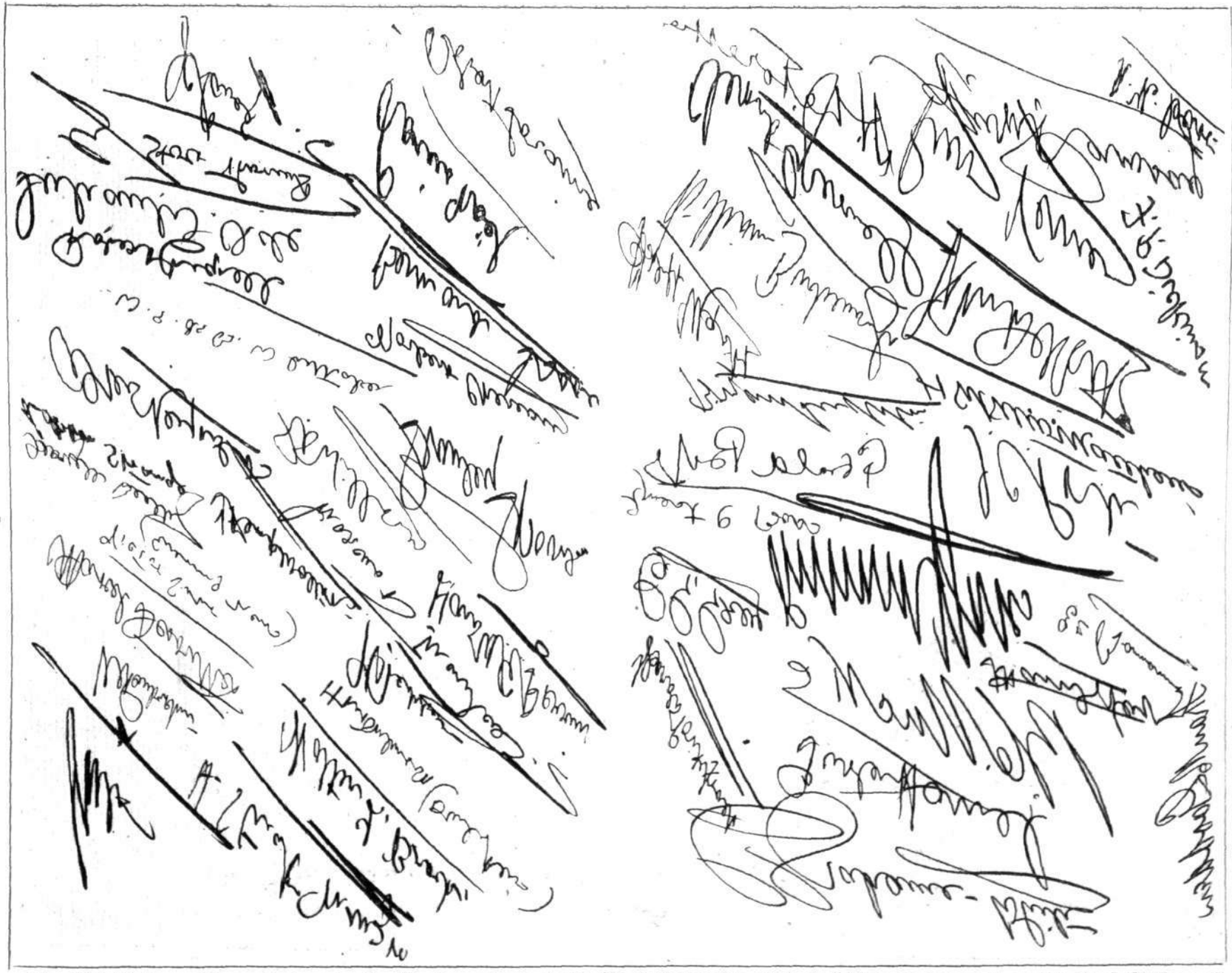
The loop plan of the tables.

guests participated under the quaint conditions. The menu itself was a work of art, and from first to last, including the shape of the table, everything was carried out with the one thing in mind, of its being a "looping the loop, upside-down" function. Evidently the press photographers had entered into the scheme, as they were awaiting the guests at eight o'clock to take their snaps before the commencement, the result of their flashlight bombs being very assertive for some considerable time into the evening. The guests having been called together by the megaphone man with the intimation that "coffee was served," the chairman, Mr. Claude Grahame-White, after the toast of "The King," announced that "You may smoke," the waiters, arrayed in mechanics overalls, at once circling round the room with coffee, clear and thick, liqueurs and tooth-picks. The Savoury consisted of *Canapé à la Chanteloup*, Sweets of a *Soufflé à la Hucks*, the Vegetable of *Asperges renversées*, the Roast being *Bécassines à la Hamel* with *Salade à la Blériot*, the Entrée a *Vol au Vent à la Hendon* and the Joint *Baron de Pauillac à l'Aviation*.

Then followed for fish the "looping lobster," which was specially announced per the megaphone man as "The lobster is now looping." In solemn procession the great dish with one King Lobster, upside down in the centre surrounded by a host of smaller brethren, was carried round the outline of the looped tables, from the chairman back to the chairman, before being scattered in portions to the guests. With, appropriately, a *Consommé de Volaille à la Grahame-White*, and *Hors d'œuvres*, the more material part of the evening's entertainment concluded, and the health of the King having been given by the chairman prior to the banquet, when Mr. Hucks endeavoured to do honour to it by drinking Giesler from a glass upside down, the speeches opened with a series of very interesting reminiscences by the chairman. In referring to Mr. B. C. Hucks and Mr. Hamel, he pointed out that the Hendon aviators thought that the best way to do honour to these popular pilots was to call all their flying brethren together at a gathering of this character, and the directors of the London Aerodrome had contributed a special gold medal to be presented to each of the guests of the evening, by way of commemoration. In mentioning Mr. Hucks first, as being the first to loop the loop in England, he thought that Mr. Hamel might be coupled with him *co-aequo*, he having been the first to take up a woman to loop the loop, although he, the chairman, was extremely sorry to say that Miss Trehawke Davies, the very courageous lady in question, was at that moment very seriously ill, and he felt that he would be echoing the sentiments of everybody present if he sent Miss Davies a telegram from them all wishing her sincerely a very speedy recovery—a



THE "UPSIDE-DOWN" DINNER.—The signatures of those present at the banquet.



THE HOSTS AND GUESTS.

Bass, Capt. E.
Baumann, E.
Beatty, G. W.
Birchenough, W.
Biss, G.
Brock, W. L.
Carr, R. H.
Cates, John.
Chereau, N.
Dessouter, M.
Forrestier, H. le.
Gates, Richard T.
Goodden, F. W.
Grahame-White, C.
Greswell, C.
Grey, C. G.
Hamel, Gustav.
Handley Page, F.
Holt Thomas, G.
Hucks, B. C.
Isaac, Bernard.
Ledeboer, J. H.
Leighton, Sir Bryan.
Loraine, Robert.
Manton, M. D.
Marty, P.
Noel, L.
North, J. D.
Orde, J. W.
Perrin, H. E.
Pontefract, H.
Porte, Lieut. J. C.
Ramsay, A. M.
Reynolds, A. G.
Savage, J. C.
Spooner, Stanley.
Strange, L. A.
Walton, T. K.
Whitehouse, R.
Whittaker, W. E. de B.
Willows, E. T.
Withers, J. E.
Verrier, P.

The "Upside-Down Dinner" given by the Hendon aviators at the Royal Automobile Club on Friday of last week to Mr. B. C. Hucks and Mr. Gustav Hamel, by way of celebrating the splendid upside-down flying of these two popular pilots. To be in keeping with the spirit of the dinner, we give above the signatures reversed and upside-down of all those who took part in this quaint celebration. Without a key to this apparent jumble it would no doubt be pretty difficult for many of the signatures to be deciphered, but by the aid of a reproduction of the same signatures the right way up which we give, the solution is easy. The names of those present and whose signatures appear above are given at the side on the right.

Photo by Fradelle and Young.

THE "UPSIDE-DOWN DINNER" GIVEN BY THE HENDON AVIATORS TO MR. B. C. HUCKS AND MR. GUSTAV HAMEL AT THE ROYAL AUTOMOBILE CLUB ON JANUARY 16TH.—A photograph of the guests showing, standing on the left, from left to right, Mr. Gustav Hamel, Mr. Claude Grahame-White (the Chairman), and Mr. B. C. Hucks. Note the form of the loop in which the table was set, in the centre loop being a reproduction in miniature of the Hendon Aerodrome, whilst the legs of the tables pointing towards the ceiling helped to give effect to the idea of the upside-down banquet. Hanging overhead was a large replica of an aeroplane, whilst the decorations on the table were also carried out in the form of continuous loops, from end to end, of ribbon, smilax, &c.

proposition which was carried with acclamation. After making very complimentary reference to other flying men who were held in high esteem at the aerodrome, including Mr. G. Lee Temple, Mr. Crawshay, &c., Mr. Grahame-White formally presented the gold medals to Mr. Hucks and Mr. Hamel.

Mr. B. C. Hucks, in replying, started his speech by "finally" wishing everybody as much luck as he had had himself, and gradually worked back by humorous and serious references, to thirdly, secondly and firstly. He thought when he first saw Pegoud perform his looping that it was entirely out of his line, in other words it was outside the sphere of everyday flying, although he might say that he had exactly the same feeling when he saw Mr. Claude Grahame-White fly at Park Royal, when he fought so well in the London–Manchester race. However, he ultimately, contrary to everybody's advice and wishes, decided to attempt the feat in France, and say nothing to anybody until he had either accomplished it or failed, with the result that he very quickly became master of this evolution, and he now considered it very simple so long as it was certain that the machine was so arranged as to stand the strain. Subject to this, there was, he thought, practically no risk in flying upside-down or looping provided that the personal element was equal to that feat. Up to the present moment he had completed 116 loops, and had promised Leeds the following week to bring it up to 130.

Mr. Gustav Hamel followed with a characteristic speech, and described how he went about his first looping of the loop. Although many people said he had not done it, he himself was satisfied he did. He determined that if he was going to break his neck he would do it from a real good height, and so he climbed rather more than some might have thought necessary, but from the terrific vertical dive which he afterwards indulged in it was just as well that he had done so.

Mr. B. C. Hucks, in proposing "The Hendon Aviators," coupled with the toast the name of Mr. "Gates T. Richard," the latter, who was otherwise known as Mr. Richard T. Gates, responding in a delightful speech, crowded with reminiscences and anecdotes, which kept the guests in a continuous roar of laughter, they at each pause clamouring for more.

The rest of the toasts, in the order of their giving, were: "British Aviation," proposed by Mr. G. Holt Thomas, and responded to by Mr. J. H. Ledeboer; "The Foreign Aviators," by Mr. Harold E. Perrin, the secretary of the Royal Aero Club, the reply being in the hands of Mr. Norbert Chereau; "The Press," given by Mr. Richard T. Gates, and responded to by Mr. C. G. Grey; and finally "The Chairman," by Mr. F. Handley Page, responded to by Mr. Claude Grahame-White.

Prior to the actual dinner and during the banquet, excellent ragtime and tango music by a band of darkies, whose playing and singing was perfectly delightful and in keeping with the spirits of the company present, was enjoyed. To many the vocal efforts of Mr. Claude Grahame-White were a revelation, he giving several selections and only with difficulty was able to resist the pressure over and over again for well-deserved encores.

A surprise was sprung in the appearance of Mr. Charles Coborn, who, after singing the ancient song of his own composition, "Two lovely black eyes" in every conceivable language under the sun, finished by giving a verse, standing on his head in the centre of the room, for a man of Mr. Charles Coborn's age a feat of no mean character.

All concerned with the getting up of this unique function are deserving of the highest praise, not the least worthy being Mons. Pruger of the Royal Automobile Club, for the excellent details of the menu and arrangements of the room.

In this issue, we give as a memento of the occasion a reproduction of the whole of the signatures of the pilots and others present at the gathering (other than the flying fox, introduced during the banquet, and whose habits are of the upside-down order), together with a list of all those participating, and a photograph showing the major portion of the banquetting room, with the tables arranged in the form of a loop.

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FROM THE BRITISH FLYING GROUNDS.

Royal Aero Club Eastchurch Flying Grounds.

MONDAY last week, Sub-Lieut. Pierce, R.N.R., making some good flights round the aerodrome in the snow. Later when snow ceased he flew to Isle of Grain, getting back just before dusk, and finishing with a fine long glide.

Com. Samson flying Tuesday in fine form on the little S. 3. Lieut. Pierce piloted the gunnery machine, S. 34, with Lieut. Clarke Hall as gunner. In the afternoon, Lieut. Littleton flew to Grain, in spite of a very high wind, returning late in the evening.

Wednesday no flying, but Thursday Com. Samson on the rebuilt Short 100 h.p. Gnome tractor making a long flight. Capt. Courtney on S. 3 flying well and banking heavily at turns. Davis flying high on Sopwith 33. Lieut. Marix on the H. Farman in fine style doing some pretty spiral glides from about 2,000 ft. Lieut. Davis went up on Avro 16. Later Lieut. Pierce took up a visitor for a long high flight on Avro 16. Samson again took up Dep. 7 for a little fancy flying. P.Os. Andrews and Bateman flying well on Avro 41. Marix took up Dep. 36 for a short time, and also went for a short turn on Avro 41. M. Farman was also taken up by different pilots.

Saturday, Lieut. Pierce piloting the Short gun machine with Lieut. Clarke Hall as passenger and gunner. Lieut. Marix was making some very fine banks and spirals on S. 65. Com. Samson on No. 3 for a long high flight. Lieut. Davis flying exceptionally well on Bristol 43. Lieut. C. Hall on M. Farman 70. In the afternoon all the school pilots making short but high aerodrome flights, mostly finishing with well-judged spirals. Lieut. Littleton flying S. 64 in fine style. Com. Samson making alarming fancy flights on S. 3. Capt. Courtney instructing in passenger seat on the S. 2 50 h.p. Gnome.

Civilian Flying.—On Friday last week, Mr. Gordon Bell was up testing a new Short tractor biplane, 100 h.p. Gnome. Taking Mr. Fairey and Mr. M. Wright together as passengers, he climbed to a good height and flew across and across the aerodrome, banking heavily at turns. After flying for about 20 mins., his engine started missing badly. Again in the afternoon he made numerous flights alone, and with passengers.

Saturday he was up again, engine running much better. Taking Mr. Nicholls up as passenger, he made a high and long flight, finishing with a very fine spiral *vol plané*. Then Mr. Bell took up two passengers at a time. All the afternoon he was making numerous short flights, and little fancy flying.

Sunday proved to be good flying weather, so Mr. Bell went for another flight in the early hours. After getting between the village and sea, he started turning round and round in small circles, switching his engine on and off—rather a risky trick, for about there there are trees covering nearly all the ground, so that if his engine did not happen to pick up again, the result might be unpleasant. After making one or two more short flights, the machine was rehoused for the day.

Gliding.—On Wednesday last week, Mr. Maurice Wright had out his "Wright" glider on the hill behind the hangars. It was extremely gusty, and one caught the machine while Mr. Wright was making a good glide, turning it over, throwing Mr. Wright out, he escaping with a few slight cuts. Later, Mr. Marden made a fine glide lasting about 5 mins. at about 50 ft. high. The wind became too gusty to do anything further, so they took the machine in again.

Brooklands Aerodrome.

MONDAY last week, Mr. Pixton flew to Farnborough on No. 8 Sopwith biplane.

Tuesday and Wednesday weather was too bad for flying, but Thursday the Bristol and Vickers Schools were busy with pupils. Lieuts. Watkins (second half), Cull, and Smyth-Piggott passed their *brevet* tests in excellent style on Bristol biplanes, in a wind blowing up to 18 m.p.h., each pupil rising to an altitude of 600 ft., and making a good landing. Mr. Barnwell was out on the Vickers gun-carrying biplane with a passenger. Mr. Pixton was testing the No. 9 Sopwith biplane. The 80 h.p. Avro biplane arrived from Manchester; also a new 50 h.p. Avro biplane, which has been ordered by Mr. Hall, of Hendon. Mr. J. Alcock was flying well on Mr. Coatalen's Maurice Farman biplane.

Mr. Davis was doing good circuits and figures of eight on Friday on his Avro. The Vickers and Bristol Schools accomplished a lot of useful work with pupils. Mr. Barnwell was testing the new Vickers Radial (50 h.p.) engine on a biplane. One of Mr. Barnwell's old Vickers pupils, Mr. V. Waterfall, was piloting the Martinsyde monoplane in a masterly fashion, doing straights and circuits with extremely well-judged landings. This pilot shows great promise, and is a credit to Mr. Barnwell, for it is one thing to float around on a school 'bus, but quite another thing to handle one of the fastest monoplanes in the world well on a first trial. Mr. Waterfall afterwards remarked that the Martinsyde machine proved extremely easy to handle, and answered its controls perfectly.

On Saturday, Mr. Alcock was out again on the Maurice Farman (100 h.p. Sunbeam) and Mr. Barnwell on the Vickers (100 h.p. Gnome engine) gun-carrying biplane. The Vickers and Bristol Schools were hard at work. Mr. Barnwell was also testing the 50 h.p. Vickers Radial engine. Mr. Raynham made some fine flights with and without passengers on the 80 h.p. Avro biplane, afterwards taking up Mr. Davis on his 50 h.p. Avro biplane for instruction, Mr. Davis then making several good flights alone. Mr. Merriam made a number of good flights with and without

passengers. Mr. Pixton was busy testing a Sopwith biplane. Mr. Elsdon was out on a Vickers school biplane.

There were some splendid exhibition flights on Sunday, Mr. Raynham being first out on the 80 h.p. Avro biplane, on which he ascended to an altitude of 5,500 ft., making an extremely fine spiral descent with propeller stationary and landing right in front of his shed, one of the finest performances this pilot has ever put up and an excellent testimony to the qualities of his machine. Mr. Merriam then went up on an ordinary 50 h.p. Bristol school biplane, and climbed to a height of 1,700 ft. in 7 mins., making a splendid landing with propeller stationary, right in front of the enclosure. Mr. Halford also made several flights on a Bristol biplane. The Martinsyde monoplane was also making a number of good flights. Messrs. Barnwell and Elsdon were out several times on the 50 h.p. Vickers Radial. Mr. Pixton made a number of fine flights with and without passengers, on a Sopwith biplane, and at one time was flying side by side with Mr. Raynham on the 80 h.p. Avro, thus affording the spectators an excellent opportunity of judging the merits of the two machines. Mr. J. Alcock took up Mr. Chapman, of Kingston Road, Leatherhead, and Master Chapman, a bright little chap of only three years of age, who thoroughly enjoyed his first trip in the air. The winner of the ballot for the free passenger flight, Mr. W. Squire, of Weybridge, had a nice trip with Mr. Raynham on the 80 h.p. Avro biplane.

The Sopwith Co. expect to have at Brooklands within a few days one of their biplanes fitted with a 100 h.p. Gnome engine, of which great things are expected. The machine in size will be between the ordinary pattern and the famous "baby" machine on which Mr. Hawker accomplished such a wonderful performance before he took it to Australia with him for exhibition purposes. One of the well-known *habitués* at Brooklands, Mr. Hurst, who has had flights on no less than 22 different machines, has joined Mr. Barnwell's pupils at the Vickers School, and should prove an apt pupil, for he has done almost everything except to pilot a machine.

Bristol School.—On Monday, 12th inst., and two following days no tuition was possible owing to the strong wind and rain.

Thursday, 15th, Halford testing, then with Lieut. Cull. Merriam followed taking Lieut. Pigott for a high flight teaching pupil to spiral; afterwards with Air-Mechanic Locker on circuits. Lieut. Watkins, Pigott and Cull flying long solos on circuits and figures of 8 in a steady wind. Merriam with Lieut. Binney who took controls at intervals for a long high flight. Lieut. Watkins, Lieut. Pigott and Lieut. Cull then flew for their certificates. Although the air was very bumpy, all three took their *brevets* in excellent style, flying skilfully at a height of 600 ft. Merriam afterwards took Mr. Racine-Jacques for a high flight in a strong wind, which finished the morning's work. Merriam made a trial in the afternoon, afterwards with Air-Mechanic Locker and Lieut. Fraser (new pupil). Halford out with Lieut. Binney on circuits and *vol plané* landings. Rain then prevented any further flying.

The next morning, Halford made a test, and then took Lieut. Binney for two flights, afterwards taking Air-Mechanic Locker for banked turns and *vol plané* landings. Merriam then sat behind Lieut. Binney and Air-Mechanic Locker on several straights, and with Mr. Racine-Jacques for landing practice. Halford took Lieut. Binney for rolling practice, but fog prevented further tuition in the morning. In the afternoon, Merriam and Halford giving tuition to Lieut. Binney and Mr. Racine-Jacques respectively, the latter instructor then taking Air-Mechanic Locker for two long flights and Mr. Racine-Jacques for one. Fog again made tuition impossible.

On Saturday, Halford out first for a trial flight, afterwards taking Lieut. Binney and Air-Mechanic Locker each for two flights at a good height. Merriam then sat behind Lieut. Binney, Air-Mechanic Locker and Mr. Racine-Jacques, the pupils executing circuits and figures of eight. After taking Lieut. Binney to 2,000 ft. with spiral descent, Merriam went up with Lieut. Palmer, the pupil having control most of the time. Halford finished by taking Lieut. Binney and Air-Mechanic Locker for straights.

Vickers School.—Thursday, last week, Instructors Barnwell, Elsdon, and Knight on biplanes with Lieuts. Crosbie and Monckton. Barnwell testing gun-carrying biplane.

Next day, Barnwell, Elsdon, and Knight with Lieuts. Crosbie and Monckton. Barnwell testing biplane 26, with Vickers Radial engine.

Saturday, Knight and Elsdon on biplane with Lieut. Monckton. Barnwell testing new gun-carrying biplane; and on Sunday, Barnwell and Elsdon on biplane 26 with passengers.

Herr Roempler, the skilful pilot of the D.F.W. aeroplane now at Brooklands.

Eastbourne Aerodrome.

INCLEMENT weather last week prevented any school work being done until Saturday, when Gassler had the E.A.C. biplane out, and after the usual test flight took Mrs. Salmon up for two lessons. Mr. Hunt had three practice stunts on the Bristol. Lieut. Davies, R.N., arrived at the aerodrome from Eastchurch on an 80 h.p. Bristol.

The weather keeping fine on Sunday, Gassler and Mr. Thornely went up together on the Bristol. Gassler then gave Mrs. Salmon three successive flights.

It was too gusty for school work on Monday, but Lieut. Davies had his 80 h.p. Bristol out, and flew back to Eastchurch.

London Aerodrome, Collindale Avenue, Hendon.

Grahame-White School.—Monday to Thursday last week too windy for school work. Friday, Messrs. Cowley, Parker, and Moore straights with Instructor Strange in passenger seat. Mr. Norris solo circuits; Mr. Cripps solo straights, circuits, &c. Mr. Lindop (new pupil) rolling with instructor.

Hall School.—Monday last week, gale and snow, but notwithstanding J. L. Hall made several circuits in blinding snow storm.

Tuesday and Wednesday, gale, very cold, and no practice.

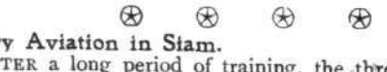
J. L. Hall flying for ¼ hour Thursday on No. 1 Caudron.

Friday, in morning, A. L. Brookes four straights, J. L. Hall instructing. Later, Denys Ware made a very pretty flight on No. 1 Caudron, landing with spiral *vol plané* from 1,000 ft. In afternoon, Messrs. H. Gearing and A. L. Brookes made three straights each, the former with tail well up. Saturday, J. L. Hall exhibitions on Caudron; too windy for school practice.

Salisbury Plain.

Bristol School.—On Monday, 12th, strong wind made tuition impossible. The next day Sippe took Voigt for a test on the 80 h.p. Bristol tractor, but the wind was still too strong for tuition. Tuition was also impossible on Wednesday and Thursday, while on Friday, although the weather had not moderated, Voigt made a trial, and then took Mr. Stutt for two flights. In the afternoon Voigt took Capt. Walcott for two flights, whilst Jullerot went up with Mr. Gipps and Mr. Stutt, the latter pupil receiving lessons in *vol plané* landings. Mr. Stutt then made a long solo on the biplane.

On Saturday the weather made tuition impossible until the afternoon, when Voigt took Mr. Stutt for several flights, giving him landing and *vol plané* practice. Jullerot meanwhile was out testing a new 80 h.p. tractor biplane.



Military Aviation in Siam.

AFTER a long period of training, the three Siamese officers, who were selected by the military authorities to learn flying, have now returned to Bangkok with three machines—two biplanes and and one monoplane. As soon as these machines are re-erected, for which purpose a French mechanic has been engaged, the officers will commence to teach their brother officers to fly.

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

Committee Meeting.

A MEETING of the Committee was held on Tuesday last, January 20th, 1914, when there were present:—Col. H. C. L. Holden, C.B., F.R.S., in the Chair, Mr. Griffith Brewer, Mr. Ernest C. Bucknall, Mr. G. B. Cockburn, Major J. D. B. Fulton, C.B., R.F.A., Mr. Mervyn O'Gorman, C.B., Mr. C. F. Pollock, Mr. R. W. Wallace, K.C., and the Secretary.

New Members.—The following new Members were elected:—B. J. A. Claudet, F. Warren Merriam, Louis Noël, Albert Picard, 2nd Lieut. C. E. C. Rabagliati, William Mair Rolph, and Max Worms.

Aviators' Certificates.—The following Aviators' Certificates were granted:—

724 Lieut. H. E. M. Watkins, R.N.R. (Bristol Biplane, Bristol School, Brooklands). Jan. 15th, 1914.

725 Sub-Lieut. J. R. W. Smyth-Pigott, R.N. (Bristol Biplane, Bristol School, Brooklands). Jan. 15th, 1914.

726 Lieut. J. T. Call, R.N. (Bristol Biplane, Bristol School, Brooklands). Jan. 15th, 1914.

The following Certificates were passed in France:—

William Mansfield.

Lawrence Fry.

Flying to the Danger of the Public.—Mr. R. T. Gates, the Managing Director of the London Aerodrome, Hendon, attended at the invitation of the Committee and gave his views on this subject. The Committee is now considering the steps to be taken to deal with all cases of flights made to the danger of the public.

Britannia Challenge Trophy.—The Committee considered the various performances of British aviators during the year 1913, including several suggestions which had been sent in by Members and others interested in aviation.

It was unanimously decided to award the Britannia Trophy for the year 1913 to Capt. C. A. H. Longcroft of the Royal Flying Corps, for his non-stop flight on November 22nd, 1913, from Montrose to Farnborough, *via* Portsmouth. The distance measured in a straight line is about 445 miles, but the actual mileage covered by Capt. Longcroft was considerably more.

Brooklands.—The Annual Licence for competitions for the year 1914 was granted.

The Chairman of the Club.

Owing to ill-health, the Chairman of the Club, the Marquess of Tullibardine, has not so far been able to take a very active part in the work of the Club, and has been recuperating in Scotland. His Lordship hopes to return to Town early in February, when he will resume his duties as Chairman.

New Premises.

The response to the circular recently issued on the question of the Club acquiring more commodious premises shows a large majority in favour of the change, and the matter will be discussed with the Members at a General Meeting which will be shortly convened.

International Schools Race. London to Paris and Back.

The Royal Aero Club has communicated its views in connection with the London to Paris Race to the Aero-Club de France, who is now considering the matter, and as soon as the various points have been agreed upon, the regulations will be issued.

It is proposed to hold the Race on Saturday, May 9th, 1914.

International Races.

The attention of Aviators and Manufacturers is particularly drawn to the following notices regarding International Races:—

THE JACQUES SCHNEIDER MARITIME AVIATION CUP AND PRIZE, 25,000 FRS.

Mr. Jacques Schneider has given a trophy of the value of 25,000 francs and a cash prize of 25,000 francs for three years for international maritime aviation competition.

The Aero-Club de France, having won the prize last year, has organisation of the race for 1914. The Prize will be competed for over a distance of 150 nautical miles. The Contest will take place exclusively at sea, outside any port, and over a course of not less than 5 nautical miles. Further details will be announced later.

Each club affiliated to the Fédération Aéronautique Internationale has the right to challenge the holder, the Aero-Club de France, and such challenge must be sent in before March 1st, 1914.

The Committee of the Royal Aero Club will select three competitors to represent the British Empire, and intending candidates are requested to notify the Secretary on or before Tuesday, February 24th, 1914, of their willingness to compete, if chosen. Applications must be accompanied by a cheque for £20, the entry fee, which amount will be returned should the entrant not be selected.

GORDON-BENNETT AVIATION CUP.

RULES FOR 1914.

The Race for the Gordon-Bennett Aviation Cup will take place in France this year.

The Race will be over a distance of 200 kilometres on a course having a minimum distance of 5 kilometres.

Competing aircraft, before taking part in the Race, will have to pass the following preliminary test:—

A flight in a straight line out and back of about 2 kilometres, without touching the ground, at a constant height of not more than 30 metres. The speed of the test shall be the mean of the speeds of the flights out and back, which must not exceed 70 kilometres per hour. In this test the aircraft must carry sufficient petrol and oil to cover the whole course of 200 kilometres. Three attempts will be allowed to each competitor.

After the qualifying tests have been passed, no modifications may be made to the aircraft. Repairs will only be allowed with the permission and under the control of the Officials.

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International Hydro-Aeroplane Competition.

The Club has received particulars of an International Hydro-aeroplane Competition to be held on the Rivers Scheldt, Meuse and Rhine, on June 15th–25th, 1914. The contest is over a course of about 1,400 kilometres and the prizes amount to about £5,000. The organisation is in the hands of the Aero Clubs of Belgium, Germany and Holland, and the competition will be held under the rules of the Fédération Aéronautique Internationale. Further particulars may be obtained from the Royal Aero Club.

166, Piccadilly, W. HAROLD E. PERRIN, Secretary.

THE ROYAL FLYING CORPS.

THE following promotion was announced by the Admiralty on the 15th inst.:—

Sub-Lieut. F. E. T. Hewlett to be Lieutenant, and reappointed to Isle of Grain Naval Air Station as Flying Officer.

The following appeared in the *London Gazette* of the 16th inst.:—

R.F.C.—Military Wing.—The undermentioned are appointed to the Reserve. Dated December 17th, 1913: Brevet Lieut.-Col. Neville J. G. Cameron, the Queen's Own Cameron Highlanders; Capt. Edward L. Ellington, Royal Artillery; Capt. George M. Griffith, Royal Artillery; Lieut. Reginald C. H. Bewes, the King's (Liverpool Regiment); 2nd Lieut. David E. Stodart, Special Reserve; and 2nd Lieut. Gordon N. Humphreys, Special Reserve.

The following appointments were announced by the Admiralty on the 16th inst.:—

Lieuts. J. T. Babington, to the "Pembroke," for temporary service as Assistant Instructor at Central Flying School; S. D. A. Grey, to the "President," temporary, as Squadron Commander, for temporary service in Air Department; A. M. Longmore, to the "Pembroke," as Squadron Commander, for command of Calshot Naval Air Station; D. A. Oliver, to the "Pembroke," additional, for command of Fort George Naval Air Station.

Sub-Lieut. F. E. T. Hewlett, to "Pembroke," additional, for temporary service as Assistant Instructor at Central Flying School, January 15th.

The following was announced by the Admiralty on the 17th inst.:

Lieut. C. E. Robinson, R.M.L.I., to "Pembroke," additional, for course of instruction at Central Flying School, January 27th.

The following was announced by the Admiralty on the 21st inst.:

R. Gill (R.N.R.) to the "Pembroke," additional, as probationary sub-lieutenant for course of instruction at Central Flying School, to date January 27th.

EDDIES.

MR. STUART HIRST is, as his name implies, a Yorkshireman, and, in addition, is a most enthusiastic patron of aviation. Though not a pilot himself, he was until recently, chairman of the Yorkshire Aero Club, and is one of Yorkshire's representatives of the Royal Aero Club. He has lent generous and active encouragement to all that appertains to aviation in Leeds, and is now proposing that the city should present an aeroplane to the Yorkshire "Terriers" for scouting during their summer manœuvres.

This, I think, is a most excellent idea, providing facilities can be given in good time to ensure a certain number of members qualifying as pilots. It would be splendid if machines could be provided by each county in England—probably with the help of the big men of the county—to be presented to their respective corps of Territorials, and I hope that the lead suggested by Mr. Hirst will be followed by others. Should Leeds really be first in this respect, it will ever stand to their credit, and I wish them luck, and hope Mr. Hirst will have no lack of support in his excellent scheme.

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Some few weeks ago our one and only "Dreamer" made some cynical remarks about an invisible aeroplane which was, so he said, supposed to be flying in America.

In these go-ahead days it is very risky to make fun of anything connected with aviation, no matter how remote the possibilities of it ever coming to pass may appear. I thought of this when I read in last week's FLIGHT that the Emaillite firm had, as the result of much trouble and experimenting, at last produced a wing-covering which is so transparent that at only the moderate altitude of a little over a thousand feet, the machine practically becomes invisible. If, and I suppose it must be, it is found that this fabric or composition will stand the strain imposed upon it when a machine is in flight, it is but a step to the making of the envelope of dirigibles of a similar material, which, owing to the size of the airship as compared with the aeroplane, will be of even more importance. Like most things, there is of course a humorous side. If all the machines at Hendon and Brooklands, used in the weekly races, were covered in this material, it would be rather a job to follow the events. I can imagine the effect of five or six pilots rounding Bittacy Hill in a cross-country race on machines that could not be seen, and I suggested to our artist that it would be a good idea to show the finish of a race at Hendon on invisible aeroplanes. I rather thought I had him there, but with the dexterity of a futurist he has given me a picture which he says shows a tight finish between a Grahame-White biplane and a Blériot at No. 1 pylon, and I must say that I am not in a position to say he has not hit it off.

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I know the Boulevard des Italiens in Paris. It is the place where one can get a good dinner for two-fifty with a large bottle of red wine thrown in, and I have found it very handy on occasion when I wanted to make a fuss of myself on very little money. There is always a fair amount of excitement going on down that way, but I read that it was above the usual one day last week when France instead of England had her airship scare—only in this instance the ship was actually seen. It was on Friday afternoon, and the populace of the district were hard at work at their usual job in the coffee and bock line, meanwhile the garçon flicked the few empty chairs and waited for his ten-per-cent., when they were startled by seeing what they thought was a Zeppelin from Berlin flying right for their beloved opera house. Crowds soon collected on the boulevards, and it is reported that one man even fired a gun, but great cheers went up when it was found that it was the Spiess, and was flying the French flag. The Spiess is the first of the rigid airships commissioned by the French army, and was making its trial trip with nine passengers on board. In spite of a high wind it left St. Cyr at half past two, and made a fine flight of an hour and a half's duration.

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There should be some brave doings at Hendon during the coming year. There will be Nieuport England, Ltd., with several machines and pilots to stir things up, and in addition Beatty, who is now back in England and was at the Upside-down dinner, proposes to start a school with four Wright machines. Then we have Hall, who is opening out considerably, and has, I believe, just purchased a new Avro, which, with his new Caudron and the old Blériot and Caudron for instruction work, will make another quite respectable school. It is a pity the much lamented Deperdussin could not have weathered the storm and have remained with us to have still further increased the number. Hendon, the chief flying ground in the past, seems intent on remaining so in the future. Yes! I really think we ought to see something worth watching during the coming season.

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I wonder what the great Antony and his queen, Cleopatra, would think could they but come back for a while to the banks of the Nile and witness the great doings now taking place there. Even to-day, when Cook's have done so much to westernize the native till they can ask for "backsheesh" without a blush showing through their black skins, these natives are mildly astonished at the inrush of flying men and machines. Just at the moment there is a perfect glut of aviation round about Cairo, and behind the great dam of Assouan must make one of the finest places in the whole world for waterplaning.

"WILL O' THE WISP."

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The Wright Automatic Stabiliser.

As we have pointed out, the automatic stabiliser with which Orville Wright has been experimenting for some time, although in principle the same as described in the original patent, as published in FLIGHT, has been improved considerably. From some information to hand it appears that whereas in the original device an important defect was that the correction was not proportionate to the disturbance, or, in other words, that a small swing of the pendulum employed for the maintenance of lateral stability set the controls going with their maximum energy, in the latest arrangement it is understood that a system of electrical contacts is employed which counteracts the inherent deficiencies of the pendulum so that the correcting effort of the automatic device is more nearly proportionate to the disturbing effect. Another improvement has been effected by concentrating as far as possible the weights at one point in order to guard against inertia and momentum effects.

SCIENCE AND AVIATION.

The following is a translation of a very interesting leading article in "l'Aero" of January 7th, 1914, by M. R. Desmons, who is a leading French writer on aviation matters, besides being Adviser to the Chief of Staff of the French Army Aviation Corps.

"Pegoud flies upside-down . . . . science had not foreseen this . . . ." This affirmation is, however, inexact, because several writers had studied, before these sensational Buc experiments, the condition of flight of a machine the lower surface of whose wings was convex, and had even foreseen the turning over of the machine, which they recognised as being without danger provided that this feat was executed at a sufficiently high altitude.

Among others, Mr. Brillouin wrote as follows in the *Revue de la Mécanique* in 1909:—

"If an aeroplane is unstable, a gust of wind may turn it over without any real danger . . . . In a note of the Academy (mentioned in the reports of May 18th, 1907, but not published by the Aeronautical Commission) I gave the opinion, which was then several years old to me, that the security of the pilot of a stable aeroplane would be assured by the use of a *nacelle* suspended by means of cardan joints, at the centre of gravity of the glider, so that the glider could turn over (which was always to be feared with gliders with small angles of attack) around the *nacelle* without carrying the latter with it and thus precipitating the occupant to the ground.

"I continue to think that with a stable aeroplane, constructed in this manner, the real position of security would be to climb to a few hundred metres from the ground so that the dive after the turning over would not involve the risk of striking the ground."

It was not haphazard and following a simple intuition that the eminent Professor at the French College wrote this opinion, but he supported it with a solid scientific study.

There is no need therefore to pretend, once more unjustly, that science is in error, and more especially to say, as so many have said for some time, that the scientific and mathematical studies have only resulted in the retardation of the development of aerial locomotion.

Too inadequately recognised are the works of Marey, Col. Charles Renard, Mr. Gustave Eiffel and many others who, although remaining in greater obscurity, have none the less lent efficient assistance to the magnificent conquest of the aerial element by French genius.

It is also, and here perhaps I am touching upon a fault inherent to our race, through not wishing to resort to the evidence of facts, and through not seeing for one's self that those who work methodically and scientifically on the improvement of aeroplanes obtain better results than those who, taking no notice of the results acquired either by experience or by the application of laws discovered by our technicians, pride themselves on their inventive genius and their intuition.

In his last conference to the "Société Française de Navigation Aérienne," Sub-Lieut. Delannay, Technical-Director of the English Breguet Company, demonstrated to us that, by departing from French machines and by utilising the results of French experiments (those of the Eiffel Laboratory in particular), the English constructors and Government, by slowly and methodically improving machines which at the beginning were clearly inferior to our French aeroplanes, are now building aeroplanes which are clearly superior to the best constructed in France.

A few days ago we mentioned that a Bristol biplane recently delivered had accomplished the splendid performance of rising to 1,200 ft. in 58 seconds with a passenger and three hours' fuel. If we mention that the power of this machine is only 80 h.p., we can see for ourselves that, of the biplane type, we have no machine in France capable of competing with the Bristol, and that only the small Ponnier monoplane "type cavalerie" is in a position to take up the glove.

What is the "Bristol," then? A machine derived from our old machines, but scientifically studied and improved by a technician, an apostle of the science and of laboratory experiments, and who, moreover, is French in culture—Henri Coanda, Technical Director of the celebrated English firm.

Every time, moreover, that a more or less fortunate discovery appears to run against the established laws, one hastens to proclaim, at the same time as the insecurity of these laws, the "failure of the science."

That is a very large word.

But what is science that its failure is proclaimed at every opportunity?

Its definition is complex and perhaps difficult to state in a few words. It can, however, be said that it is composed of two essential parts: analytical and synthetical observation and extrapolation. And this is summed up as follows: To observe the natural phenomena, arrange them and compare them so as to arrive at the terms of the laws which govern them, laws which will at least permit of anticipating facts not yet ob erved.

But we cannot ask aeronautical science, inexistent a few years ago and in which many gaps still remain to be filled up, to present such logic as permitted Leverrier to discover his planet through his insistence in searching for another which did not conform exactly to the recogni ed exact laws and brilliantly confirmed by this splendid discovery.

We must, nevertheless, not forget that natural phenomena are above all continuous and rational, and if a certain fact appears to us inexplicable according to knowledge already acquired, we must not hasten to conclude that such knowledge is incorrect or without any practical interest.

Much is often said of the error according to which the power developed by birds was formidable, or of the "Querelle des Sinus" (quarrel of the Sinus), but it is not said that at the time of these incorrect theories their incorrectness was explained by the state of the experimental knowledge which had then been acquired.

If aerial flight was decreed impossible, it was because the true form of the reaction of the air on the surfaces was not known, and it is only the "scientific" experiments of the Eiffel Laboratory or of the Saint-Cyr Aerotechnical Institute that have brought to light the "cause" of aeroplane flight, the sustentation by dorsal depression.

It must not be said that if an aeroplane had not flown this depression had not been discovered, because another fact could have brought out an analogous study and an analogous conclusion.

Aeronautical science is not, therefore, a failure because somebody believes they have realised an experiment not foreseen by the aviation theorists, no more so than was physical science a failure when they believed to have found in radium a body giving forth active radiations without any consumption of energy. Then also was proclaimed the failure of the universal principle, "Nothing is lost, nothing is created, everything is transformed" until the day when it was recognised that radium, like all other bodies, "wears itself away" in supplying energy.

The same thing applies to aeronautics. All the facts, even the most paradoxical, are explicable scientifically, and may be classed under the general laws which are drawn up and specified every day.

The discovery of the dorsal depression and its importance relative to the ventral depression is of such a nature as to explain many phenomena and to facilitate progress in many directions.

The aviator knew that he flew; the technician tells him why he flies, and thus gives the former means for improving his flight. Unfortunately, in France, enthusiasts as well as sceptics, we are always inventing, but we improve existing things very little, and for this reason, with French conceptions and with French scientific laws, the foreign industry creates products which soon excel our own on account of their being more methodically and scientifically improved.

R. DESMONS.

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Blackburn and Hucks at Leeds.

ON Wednesday, Thursday and Friday of last week, H. Blackburn had his 80 h.p. Blackburn out each day taking up passengers. In spite of heavy rain a crowd of over 10,000 went out to Moortown on Saturday to see the flying. Blackburn was up in the rain doing switchbacks and banks, after which B. C. Hucks during a 20 min. flight on the Blériot, made 8 loops at a height of about 700 ft. and flew upside down for over half a minute. On Sunday afternoon, Blackburn, with Dr. Christie, flew to York and back.

Sunbeam Activity at Brooklands.

ON the M. Farman with 100 h.p. Sunbeam engine, J. Alcock for about 2 hours each day on Thursday, Friday, Saturday and Sunday last, at Brooklands, making exhibition flights and taking up passengers.

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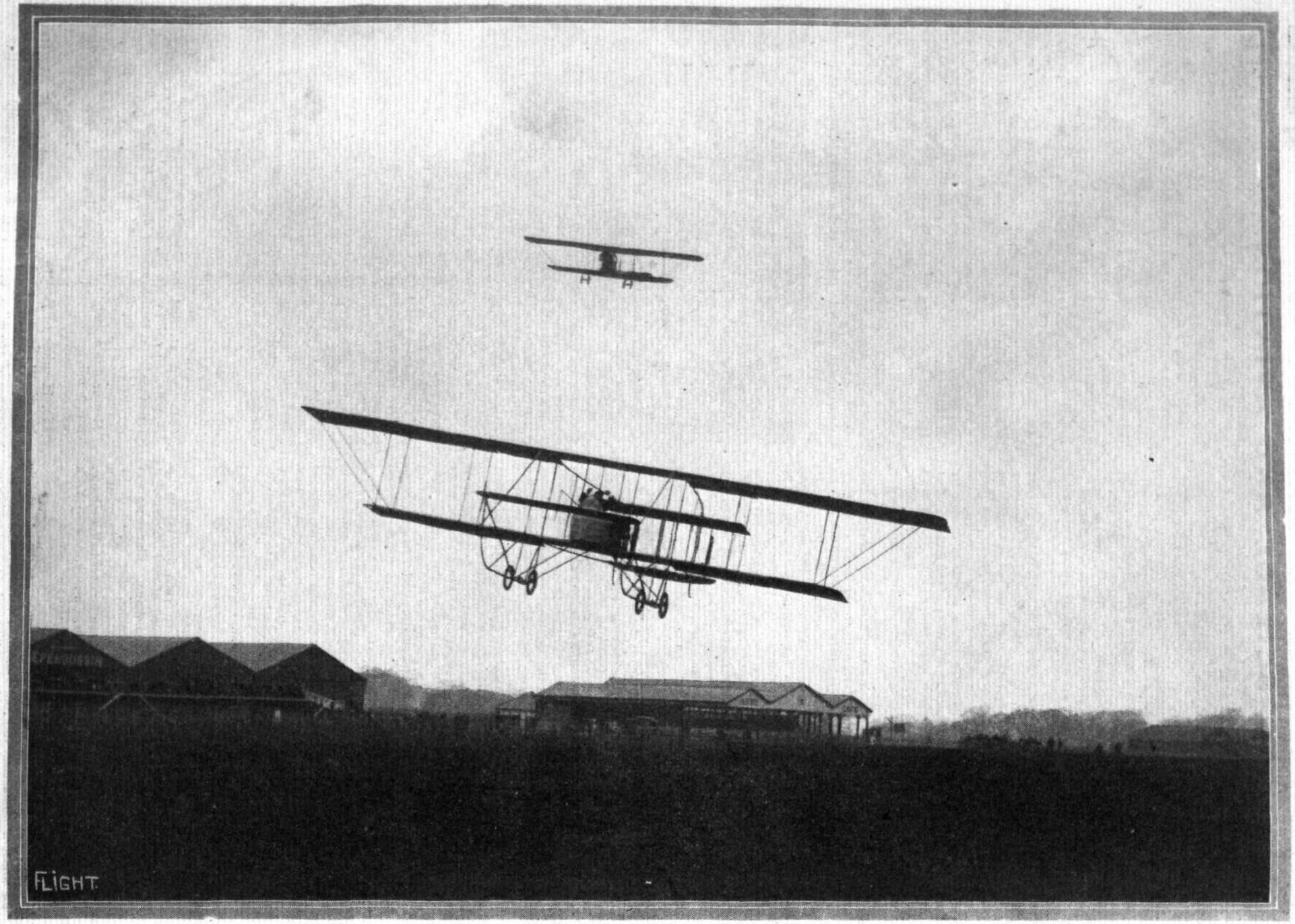
The Britannia Trophy.

IT will be seen from the official notices of the Royal Aero Club on p. 91, that the Committee have awarded the Britannia Trophy, offered by Mr. H. Barber for the most meritorious performance by a British aviator during 1913, to Capt. C. A. H. Longcroft, of the Royal Flying Corps, for a non-stop flight on November 22nd from Montrose to Farnborough, *via* Portsmouth. Measured in a straight line the distance is about 445 miles, but the actual mileage covered by Capt. Longcroft, owing to deviations, was considerably more.

Mr. Hawker in Australia.

FROM Sydney (N.S.W.) comes word that H. G. Hawker intends to fly the Sopwith biplane from Melbourne to Sydney, a distance of 450 miles, and also that he still contemplates attempting to loop the loop.



Mr. L. Noel on the Maurice Farman, flying hands off during the speed handicap on Saturday. Above is seen the Caudron piloted by Goodden.

FLYING AT HENDON.

LAST Saturday saw the third winter meeting carried out at Hendon with the usual success that has characterised these meetings in the past. The weather was ideal for flying, there being little or no wind, and in spite of the cold, damp state of the atmosphere a good number of visitors turned up. The proceedings were opened shortly after 2.30 p.m. with exhibition flights by W. Birchenough and Marcus D. Manton on 50 h.p. G.-W. 'buses, W. L. Brock on the 80 h.p. Blériot—now quite itself again after its mishap with Father Christmas a little while back—and Louis Noel on the 70 h.p. Maurice Farman. R. H. Carr also came out on the resurrected 50 h.p. G.-W. 'bus (No. 109), which disagreed with M. Osipenko in the not far-distant past. Brock made a high flight of some 3,000 or 4,000 ft., disappearing at times above the clouds, and Noel, who had a lady passenger, made one of his pretty glides with the engine stopped. Philippe Marty then came out on the 80 h.p. Morane-Saulnier with a passenger, Manton following immediately after on the twin rudder 'bus with a passenger. F. Goodden ascended next on the 45 h.p. Caudron (freshly doped), and put up some magnificent steeply-banked spirals and nose dives, quite in the Chanteloup style. In the meanwhile, L. Strange, on a G.-W. 'bus, and J. L. Hall on his 35 h.p. Caudron, joined the others in the air. Hall, by the way, will have two new machines in commission very shortly, an Avro biplane and a 50 h.p. Gnome-Caudron (two-seater) which has been constructed, we understand, by Mr. Hall himself mostly from the Caudron previously flown by G. L. Temple. An interesting feature in connection with this machine is that the planes are double surfaced.

At 3.30 p.m. a start was made for the speed handicap, which was flown in two heats of four laps each and a final heat of six laps. The starters in the first heat were R. H. Carr on the rebuilt 'bus No. 109 (2 mins. 54 secs.), F. Goodden on the 45 h.p. Caudron (1 min. 35 secs.), Louis Noel on the 20 h.p. Maurice Farman (1 min. 30 secs.), W. L. Brock with a passenger on the 80 h.p. Blériot (scratch). Carr's new mount showed a marked improvement in speed, and kept ahead throughout the race and crossing the line first. Brock gained on all but Carr, and came in second, 10 secs. behind. Goodden and Noel, who started almost simultaneously, kept together until the last lap, when Noel got in front and obtained third place by 11 secs., with Goodden 4 secs. after. Whilst the first heat was in progress, Gustav Hamel was up in his 80 h.p. Morane-Saulnier, making numerous "apple turnovers" at a height of between 1,000 and 500 ft. It is a very strange performance, this of Hamel's, no so picturesque as it is curious, for the machine has the appearance of tumbling about anyhow.

Five started in the second heat as follows:—L. Strange on a G.-W. biplane (3 mins. 35 secs.), Marcus D. Manton on the other 'bus (2 mins. 39 secs.), E. Baumann on the 45 h.p. Caudron (2 mins. 1 sec.), Pierre Verrier on a new 70 h.p. Maurice Farman (1 min. 15 secs.), and Philippe Marty on the 80 h.p. Morane-Saulnier (scratch). This heat resulted in a splendid finish, the first three machines coming in within $\frac{3}{4}$ of a second. Limit man and scratch man changed positions in this race, the latter overtaking his competitors in fine style, passing the last man by $\frac{1}{4}$ of a second only. Baumann only just failed to pass Manton by $\frac{1}{4}$ of a second, whilst Verrier also came in close upon Baumann some 8 secs. behind, Strange being 1 sec. in the rear.

Before the final was flown Hamel made a passenger flight on his Morane-Saulnier, and Hall also made another flight on his Caudron. The final heat was made up of R. H. Carr (4 mins. 23 secs.), Marcus D. Manton (3 mins. 48 secs.), W. L. Brock (40 secs.), and P. Marty (scratch). Again Carr, who flew very low in both his heats, maintained the lead throughout, Brock and Marty, who had been gradually drawing closer together, coming in second and third respectively, separated by intervals of 12 secs., Manton being last, 22 secs. behind Marty. After the final all the pilots ascended and it seemed as though they were all smitten with an attack of "loopus upsidedownitus." Hamel was turning out "turnovers" on his Morane-Saulnier, Verrier was putting up some very creditable Chevillard stunts on a new 80 h.p. Henry Farman. Manton was waltzing on the G.-W. 'bus, whilst Goodden on the Caudron, Brock on the Blériot, and Noel on the Maurice Farman were performing like evolutions until it was too dark to see.

Speed Handicap. Final Heat (6 laps).

		Handicap.	Handicap Time.
		m. s.	m. s.
1.	R. H. Carr (50 h.p. G.-W. biplane) ...	4 23	11 47
2.	W. L. Brock (80 h.p. Blériot monoplane)...	0 40	11 59
3.	Philippe Marty (80 h.p. Morane-Saulnier monoplane)	scratch	12 11
4.	Marcus D. Manton (50 h.p. G.-W. biplane)	3 48	12 33

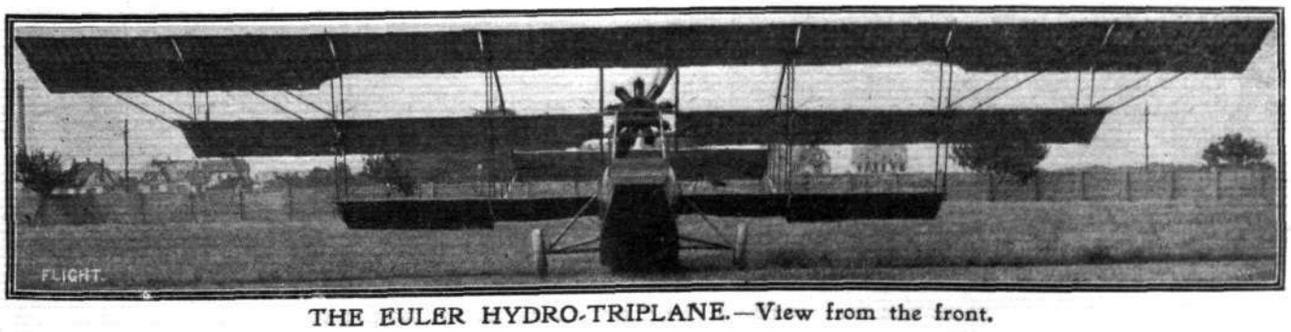
On the next day, Sunday, most of the Hendon pilots were out, and numerous exhibition and passenger flights were made. The principal events on this day, however, were some wonderful exhibitions by Verrier on the Henry Farman, Brock on the Blériot, and Hamel on his Morane-Saulnier. In addition to performing his usual upside-down stunts by himself, Hamel repeated these with Lady Victoria Pery as passenger. He also flew his machine in company with Claude Grahame-White, who was piloting the Maurice Farman, with Mrs. Hall Walker as passenger, to Kenwood (adjoining Hampstead Heath), the residence of the Grand Duke Michael of Russia. Grahame-White landed in the grounds, but Hamel returned, looping the loop before doing so. Brock made a fine altitude flight, attaining a height of 7,000 ft., and finishing up with a splendid *vol plané* from over North Finchley.

THE EULER HYDRO-TRIPLANE.

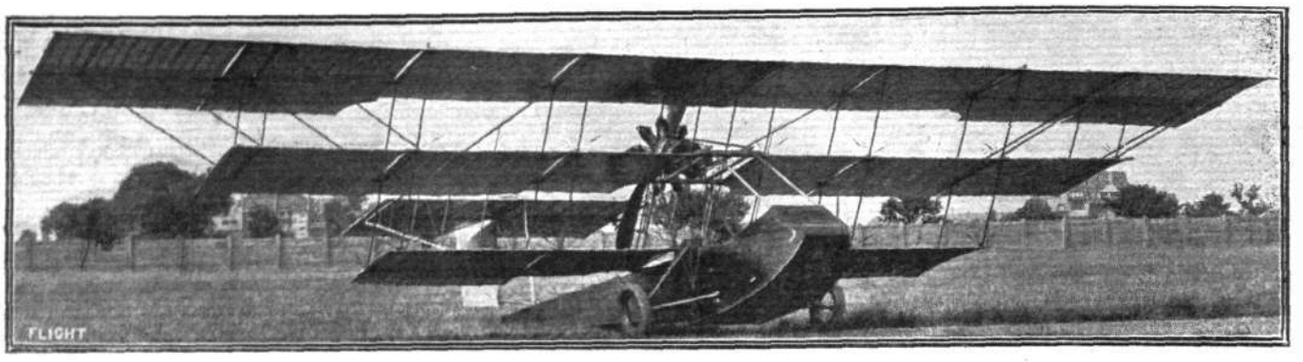
SINCE Mr. A. V. Roe's experiments with a triplane which was later discarded for machines of the biplane type no successful triplane has, so far as we know, been constructed in this country. It is quite conceivable, however, that in time to come, when greater loads will have to be carried than is the case at present, the triplane type of machine will be revived, for constructional difficulties must of necessity put a limit to the span it is technically advisable to give a machine, and the triplane construction seems to be the easiest solution of the problem of obtaining the required larger lifting surface.

It is no doubt with this end in view, that the Euler hydro-triplane has been designed, and incidentally it is, to the best of our knowledge, the first successful hydro-triplane constructed.

From the accompanying photographs, it will be seen that the three main planes have an increasing span, that of the bottom plane being 8 m., that of the middle plane 10 m., whilst the top plane spans 14 m. The extensions of the uppermost planes can be folded down, thereby reducing the overall span by about 4 m. In order to diminish the interference of the planes without



THE EULER HYDRO-TRIPLANE.—View from the front.

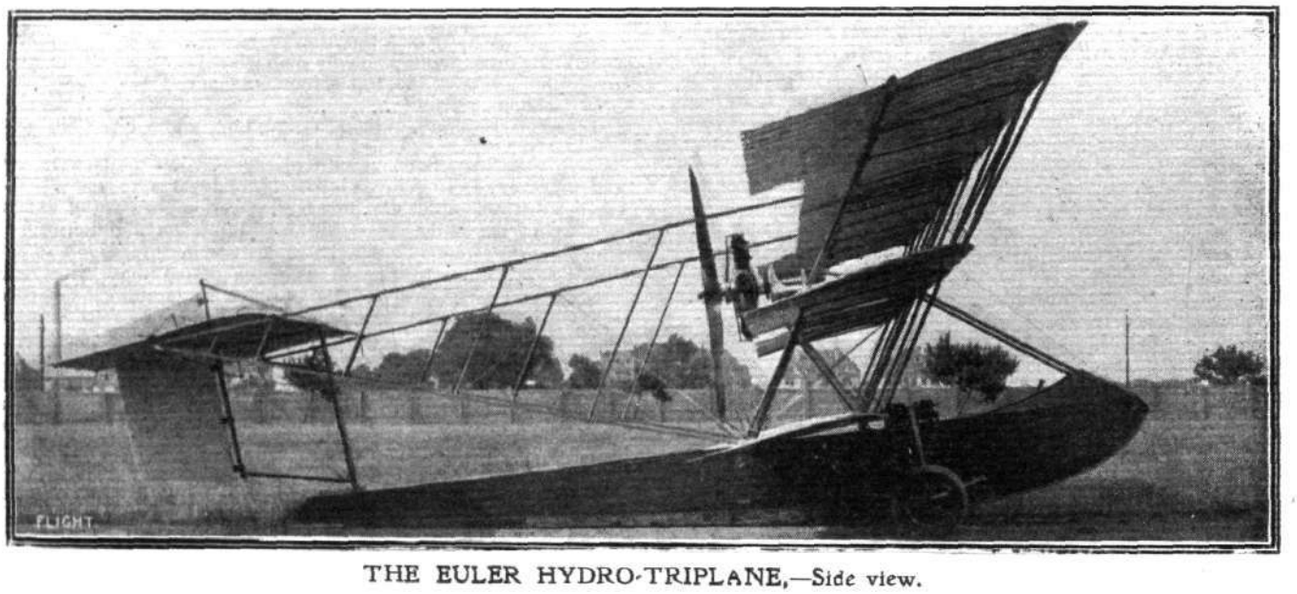


THE EULER HYDRO-TRIPLANE.—Three-quarter front view.

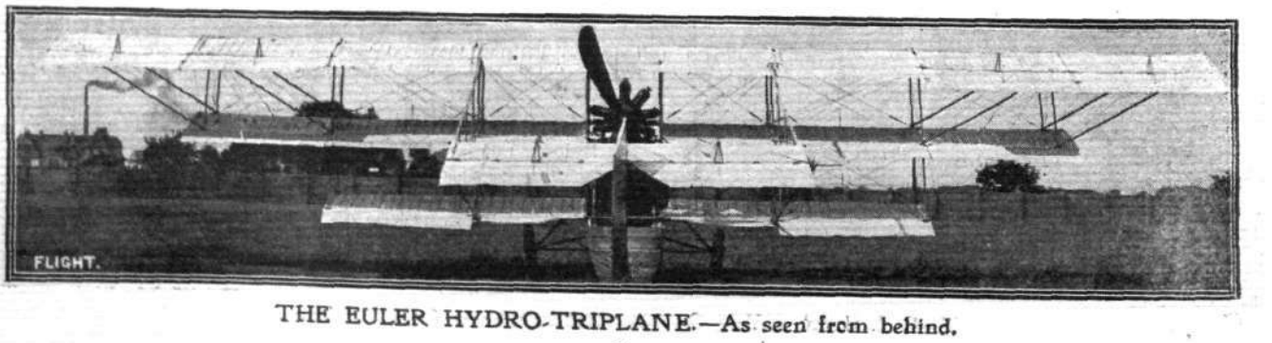
making the gap between them of excessive proportions the planes have been given a very pronounced stagger forward, a system which is finding increased favour with aeroplane designers generally.

The 100 h.p. 9-cylinder Gnome engine is mounted immediately above the centre plane, and is protected against the spray of water by the bottom plane. In order to keep the centre of gravity fairly low, the petrol tank has been placed down in the float or boat—for this machine is really a flying boat, having only one central float. Petrol is forced from this main tank to a small service tank near the engine, by means of compressed air contained in a special air reservoir in the rear part of the boat.

Carried on four tail booms attached to the rear spars of the top and bottom main planes respectively are the tail planes, which consist of a fixed tail plane to the trailing edge of which is hinged the elevator, and of a vertical rudder supported on a framework coming up from the rear part of the boat. This latter member is 7 m. long and 1 m. wide, and is of the stepped type. The pilot's and passenger's seats are arranged tandem fashion, the pilot occupying the front seat. It will be noticed that in addition to the boat a landing chassis is fitted. When the machine is used on the water the wheels can be raised by the pilot, and lowered again if he desires to alight on land, so that the machine really belongs to the amphibious class of aeroplanes. The landing chassis is sprung by means of rubber shock-absorbers attached to the gunwales of the boat.



THE EULER HYDRO-TRIPLANE,—Side view.



THE EULER HYDRO-TRIPLANE.—As seen from behind.

FLIGHT

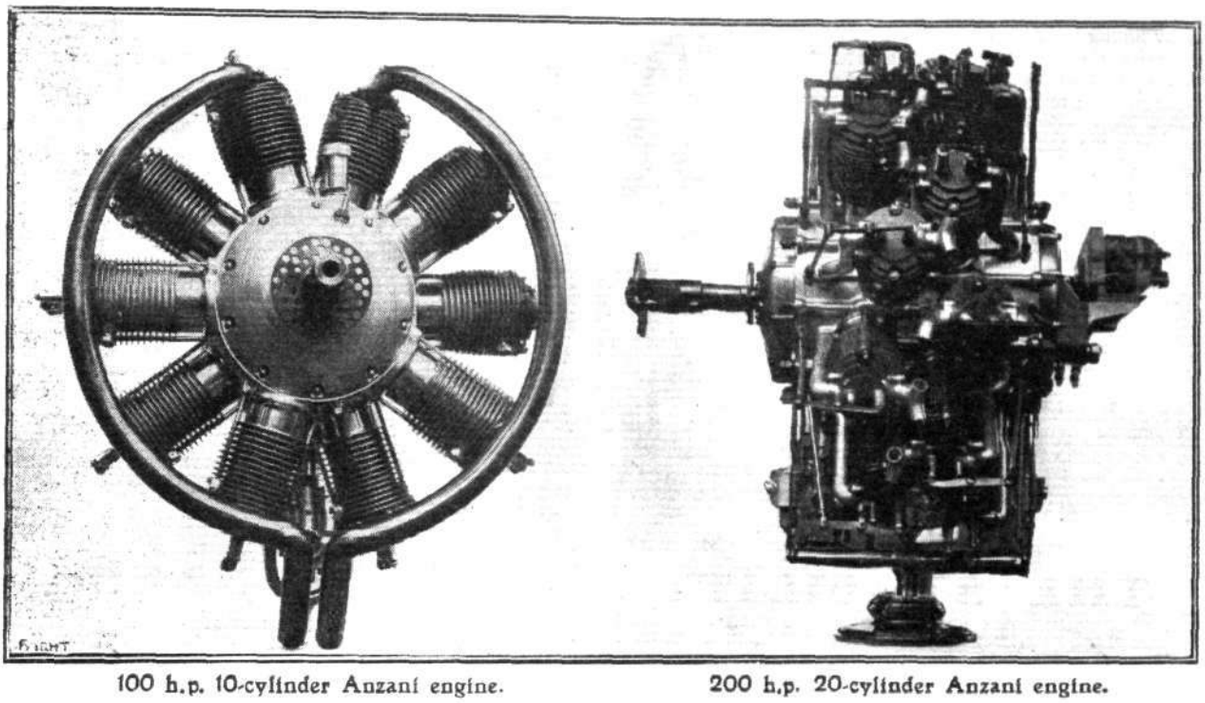
AERO ENGINES AT PARIS SHOW, 1913.

THE design of engines of high power-weight ratio still continues to attract the attention of engineers, although the tendency to produce motors embodying some freak construction is not so much in evidence nowadays as formerly. At the Paris Show no fewer than 18 manufacturers exhibited 57 different engines, of which only one —the Austro-Daimler—was of other than French manufacture, and as is perhaps to be expected from the success which has been achieved in the past by air-cooled engines, the majority of makers have adopted this form of cooling. Without exception, this is true of all the engines of recent introduction, and because the disposition of the cylinders in star fashion renders the problem of weight reduction a comparatively simple matter, we find that this arrangement is also employed, whilst all but the Anzani and the Edelweiss engines are of the rotary type. The absence of any British representative is somewhat to be regretted, notwithstanding the proximity of the Aero Exhibition and the Military Aeroplane Engine Competition, since there are several engines produced in this country which have performances to their credit that, to say the least, compare very favourably with those of the best engines manufactured abroad.

The innovations made by established makers are principally in regard to the details of construction, and as such are less obvious than real. The reciprocating parts have been lightened, valve areas increased, the detail design has been simplified, made more compact, and improved by the natural process of evolution and as the result of experience, whilst a more extensive use has been made of the higher grades of materials now available, all of which should react beneficially by permitting higher powers, increased speeds and greater reliability to be attained. As regards the use of higher engine speeds, and gearing down the propeller (as is done on the Chenu, Renault, Panhard, and De Dion) within certain limits, there would not appear to be any insuperable objection to such a method of obtaining a higher power-weight ratio, providing the engine has been designed for running continually at those speeds. The limit imposed is, however, reached when the loads upon the bearings at the moment of explosion are equal to the maximum inertia loading at the end of the exhaust stroke, which speed is attained when the engine revolutions are somewhere in the vicinity of 1,600 per minute, or, perhaps, slightly higher in modern work. This will also probably approximate to the most economical and reliable speed of the engine, providing that a sufficiently large charge of gas is drawn into the cylinder, since the bearings will, under these conditions, be subjected to the least maximum pressure. In this connection mention may be made of the absence of some form of oil cooler on any of these motors—a very desirable fitting on vertical, or any other type of engine in which a large quantity of oil is carried in the crank-case, in order to keep up the viscosity of the oil on long distance flights and thus render failure through defective lubrication from taking place. Its utility would probably be limited on any engine extravagant on oil, but not where the same lubricant is used over and over again.

The limitations imposed on the bore of the cylinders where air-cooling is used is evident from the large number of cylinders now employed on high power engines of this type; which, whilst diminishing the falling off of power in the event of the failure of any one cylinder, as well as conducing to a greater uniformity of torque, and hence a better propeller efficiency, would appear to introduce increased complication and difficulty in locating defects should they arise.

The problem of valve operation has been attacked in an exceedingly novel manner on the two "monosoupape" Gnomes, whilst on the Esselbé and the S.H.K. motors a piston-sleeve combination has been adopted. The results of tests made with these engines under actual flying conditions are awaited with interest, as valve trouble is a most prolific cause of engine failure, especially in air-cooled engines.

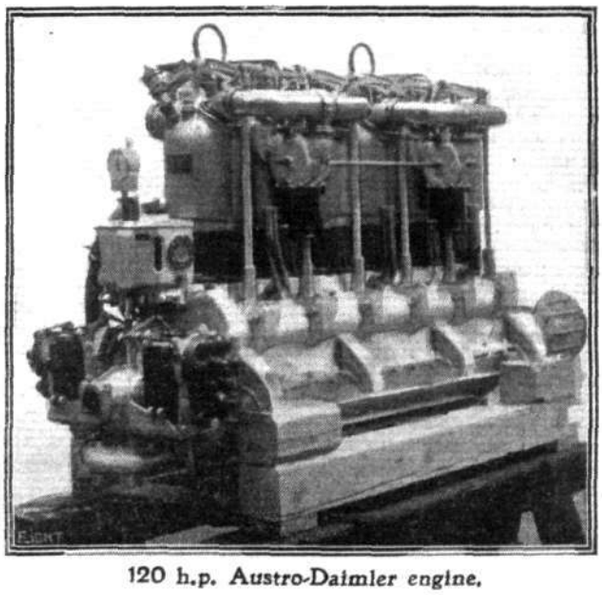


100 h.p. 10-cylinder Anzani engine.

200 h.p. 20-cylinder Anzani engine.

Anzani.

This renowned firm of engine builders made an excellent display on their stand, as in addition to the large range of standard models, the three new engines—70, 125 and 200 h.p.—were exhibited.



120 h.p. Austro-Daimler engine.

The new designs follow the usual Anzani arrangement and construction very closely—the cylinders being arranged in sets of five around the circular aluminium crank-case, which is a single casting in the case of the 10-cylinder engines and in three parts on the 200 h.p. model.

The cylinders, which are of a special grade of cast-iron, are secured in position on the crank-chamber, by long bolts passing up the sides of the cylinders, the exhaust-valves being situated in the heads at the front of the engine, and the inlet-valve at the rear; excepting on the 200 h.p. engine, where, from the arrangement of the cylinders it is more convenient for the inlet-valves (which are connected by piping to two mixing-chambers cast integral with the crank-case, each of which is fed from a separate carburettor) to be placed on the front of the engine for the two forward groups of cylinders, and at the rear for the two back groups. The exhaust pipes, which are clearly shown in the illustration, are formed by short Y pieces on the 200 h.p., and by crescent-shaped piping on the other models, which give a distinctive appearance to the engines.

The pistons are of cast iron fitted with two rings and machined on the interior and exterior, while the crank-shaft and connecting rods are of chrome nickel steel. The method of attaching the connecting rods to the crank-pin originally employed is still retained; namely, by machining helicoidal feet on the ends of the former, which have lateral extensions over which bronze rings in halves are bolted.

The lubrication is under pressure, being forced through the interior of the crank-shaft to the crank-pin, and from thence under centrifugal force to the cylinders and pistons. In the largest engine a double pump is employed with separate leads therefrom to the front and rear sets of the cylinders.

High-tension magneto ignition is provided by a Gibaud magneto running at a speed of 3,000 revs. per min. on the 10 and 20-cylinder engines, but two independent magnetos are fitted on the latter, each of which supplies current to the two sets of ten-cylinders attached to one crank.

Austro-Daimler.

These engines are made in three sizes, a four-cylinder of 65 h.p., and two six-cylinder engines of 90 h.p. and 130 h.p. respectively, all of which are fitted with water cooling and are of the vertical type. The design of these engines has undergone little change during the past year, and hence it is only necessary to append the briefest description of them.

The cylinders are made separately of cast iron with the inlet and exhaust seats and passages formed in the head, over which a copper jacket is electrolytically deposited. The valves are inclined at an angle of about 20° with the vertical, and are operated by a single rocking-lever and push-rod from a cam-shaft fitted in the crank-chamber. The special laminated springs employed for closing the inlet and exhaust-valves render it possible to use a very light yet substantial valve construction.

Ignition is effected by a single Bosch H.T. magneto on the two smaller models, but a supplementary system of accumulator ignition to separate plugs is provided as an auxiliary. The Bosch electrical self-starter is also incorporated in all these engines, which, should there be an explosive mixture in the cylinders, enables the pilot to start his engine up from his seat in the machine. On the 130 h.p. engine, two independent magnetos, one of which is of the dual type, are provided, giving two-point ignition. This engine may, like the 65 h.p. and the 90 h.p., be started from the pilot's seat by the aid of an electrical self-starter, but a starting handle which is geared down 1½ to 1 is also fitted. Two carburettors are used on the two six-cylinder engines, and thrust bearings are fitted in a special housing on all models at the propeller end of the crank-shaft.

The whole of the ignition, lubricating and cooling mechanism is fitted at one end of the two larger engines, and gives them a very neat, compact appearance.

A special lightweight radiator is manufactured by this firm, and weighs 40, 53 and 62 lbs. for the 65, 90 and 130 h.p. engines respectively. *(To be continued.)*

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THE STABILITY OF AEROPLANES.*

ILLUSTRATED BY EXPERIMENTS WITH MODEL GLIDERS.

By LEONARD BAIRSTOW, A.R.C.Sc.

THE problems which arise in the course of a study of aeroplane stability are of considerable complexity as compared with those confronting engineers in other branches of locomotion. In marine engineering probably the motion of a submarine, when submerged, presents problems most nearly approaching those of aeronautics, but the approximation is rather to the dirigible than to the aeroplane. The aeroplane is the only man-carrying apparatus which must be in rapid motion before it can fulfil its function as a weight carrier. In the first place, then, it is obviously necessary to maintain its speed of flight, but this is not a sufficient condition of safety. An aeroplane may fail in other ways than by failing to maintain its speed, for it may roll over, turn tail foremost, or pitch completely over. Various combinations of these motions may occur, and the nature of the failure to maintain a steady motion then becomes somewhat complicated.

In all probability difficulties in respect to stability limited the duration of the early flights of Santos Dumont, Farman, Blériot, &c. It may be said that the controls were imperfect before the Wright Bros. introduced their system of wing-warping in conjunction with rudder action, and that this deficiency in control would be sufficient to account for the partial failures of the early aviators. Although this objection may hold good, it will surely not be contended that a machine which is totally dependent on the skill of the pilot for its safety is as good as one which can right itself without the pilot's assistance.

The following definition of a stable aeroplane is proposed as embodying the above expression of opinion:—

"A stable aeroplane may be defined as one which, from any position in the air into which it may have got either as the result of gusts or the pilot's use of the controls, shall recover its correct flying position and speed when the pilot leaves the machine to choose its own course, with fixed or free controls, according to the character of the stability."

Sufficient height above the ground is presumed to allow an aeroplane to reach a steady flying state if it is able to do so. The more rapidly the aeroplane recovers its flying position the more stable it may be said to be. If a pilot is necessary in order that an aeroplane may return to its normal flight position, then the aeroplane itself cannot be said to be stable, although the term may be applied to the combination of aeroplane and pilot.

Inherent and Automatic Stability.—A sub-division of stability is useful, the terms "inherent" and "automatic" being already in use. An aeroplane is said to be "inherently stable" if, when the controls are fixed in their normal flying position whilst the aeroplane is in any position and flying at any speed, the result is to bring the machine to its normal flying position and speed. "Automatic stability" should be used only to describe stability obtained by a mechanical device which operates the controls when the aeroplane is not in its correct flying attitude and so rights the flying machine.

Although the subject of stability may be thus sub-divided, it does not necessarily follow that the methods used for producing inherent stability do not throw light on the requirements for automatic stability devices. It can be seen axiomatically that before a designer is in a completely satisfactory position he must have information which will enable him to find the motion of an aeroplane under any conceivable set of circumstances. The same information which enables him to calculate the inherent stability of an aeroplane is also that which he uses to design effective controls and the same as that required for any effective development of automatic stability devices.

It may be said that a designer can never tell the nature of the gusts which his aeroplane will have to encounter and therefore cannot anticipate the consequences to the flying machine. In this respect he is only in the usual position of the engineer who uses his knowledge to the best of his ability and admitting his limitations provides for unforeseen contingencies by using a factor of safety.

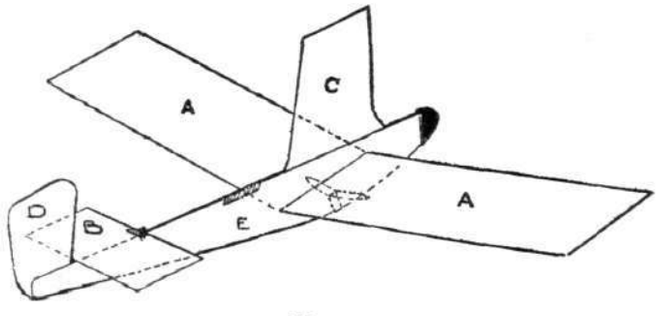


Fig. 1.

Nevertheless, in spite of such limitations the mathematics is not, as is often supposed, unable to deal with the problems arising from flight in a gusty wind.

* Abstracts from a paper read before the Aeronautical Society of Great Britain at the Royal United Service Institution, Whitehall, S.W., on January 21st, 1914.

Having defined inherent stability, an attempt will be made to show, by means of a model, that it is possible to design a flying machine, not carrying a pilot, which will take up a correct flying attitude and speed, no matter what its original attitude and speed may be, *i.e.*, no matter how it is launched or thrown into the air.

The model shown in Fig. 1 may be thrown into the air in any way whatever, and provided only that no object is struck in the meantime, will soon be flying correctly. To show the effects without danger of collision with objects in the room a clear drop of 15 to 20 ft. is required with about 30 ft. clear in every direction. The flights which will be attempted are :—

(*a*) Simple launching in approximately the correct attitude and at the proper speed.

(*b*) Dropping with the model right side up.

(*c*) Dropping with the model inverted.

(*d*) Dropping with the wings vertical.

The latter is the most likely to end in collision with objects in the room and more than one attempt may be necessary before an uninterrupted flight is obtained.

Effect of Gusts.—The model which has been flown as an indication of what may be expected of an inherently stable machine has had the advantage of flying in comparatively still air. The objection is often raised that the calculations presume still air and neglect the existence of gusts. The objection is plausible and yet quite untenable when examined carefully. For instance, the mathematics includes a term for the effects of side-slipping of the aeroplane. Exactly the same term applies if the aeroplane continues on its course but receives a gust from the side. A head gust and an upward wind are similarly contemplated by the mathematics, and it is impossible to conceive a gust of such a complicated nature that the mathematics does not provide the mechanism for examining the effects on the motion of an aeroplane.

Given sufficient head room, an inherently stable aeroplane will weather any gust it may receive. In doing this, it will roll, pitch, change its course and speed, &c., so that any disturbance will die out in a time of, say, 20 to 30 secs. Successive gusts simply add their effects and no matter what the aeroplane has been doing previously its motion at any instant will not depend appreciably on anything but the gusts encountered in the last half minute of its flight. In this time an aeroplane would have travelled half a mile or more and it may be contended that much may happen in this time that is undesirable. The rate of reduction of the disturbance might be increased if desired, but a problem of an entirely different kind then becomes important.

"Weathercock" Stability.—A stable machine, whether the stability be inherent or automatic, must turn into the relative wind more and more rapidly as the stability is increased and therefore a very stable machine will be tossed about in a wind more than a less stable machine. If the stability is too great the result will be discomfort to the pilot.

A distinction is here of importance; existing machines turn into the relative wind with great rapidity. The slow motions tending to restore the machine to its correct attitude arise from the inclinations of the machine relative to the earth, and it appears probable that these slow motions may be made quicker without at the same time increasing the rapidity of the already existing rapid motions. In other words, it appears that the stability of modern aeroplanes might be greatly increased without introducing any further discomfort to the aviator.

It follows from these remarks that a useful automatic stability device should be gravity controlled, either directly or indirectly. Any device which does not satisfy this condition can only be expected to regulate the motion of the aeroplane relative to the air, and as this is not in itself a difficult stability problem, its use will be confined to securing greater comfort for pilot and passengers.

An attempt will now be made to indicate experimentally some of the consequences of failure to obtain stability, and then to draw attention to those features of an aeroplane which are of primary importance in their effects on its stability.

Longitudinal Stability.—In connection with the disturbances which give rise to the problems of longitudinal stability, broad distinctions have been made by Mr. Lanchester, and the subject is thus divided into three sections, which may be briefly referred to under the heads :—(*a*) Catastrophic instability; (*b*) rapid oscillations; and (*c*) phugoid oscillations.

Catastrophic Instability is concerned particularly with the effects on an aeroplane of upward or downward gusts. In certain cases the altitude of the machine in steady flight may be completely altered by a sudden vertical air-current. The new flight position is usually upside down, and should it occur without the pilot being strapped to his seat he would inevitably be thrown out. If strapped in, the pilot may recover his alternative position of steady flight by the use of the controls.

Catastrophic instability may be illustrated by a model similar to that of Fig. 2. Launched in one way the model flies quite well as an ordinary glider. A different setting of the launching apparatus produces a quite different result; the model dips suddenly, turns over, and continues its flight in the direction opposite to that in which it was launched. Catastrophic instability is not very difficult to avoid, the sole condition to be satisfied being, "that for any one setting of the elevator there shall not be more than one position for which the pitching moment about the centre of gravity shall be zero."

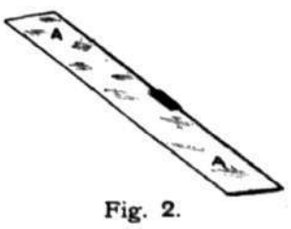


Fig. 2.

Rapid Oscillations.—The rapid oscillations of an aeroplane depend almost entirely on the forces and couples arising from an inclination of the relative wind to the direction of flight and are scarcely affected by the earth's attraction. The rapid oscillations almost always die down, but a flight will be shown in which it appears that they develop into a steady rotation of the model. In certain cases the rapid oscillations change into a dead beat motion which cannot give rise to a dangerous motion of the aeroplane.

Phugoid Oscillations.—For actual aeroplanes the phugoid oscillations are comparatively slow, the period being about 20 secs. The aeroplane is stable if the amplitude of any oscillation decreases, and this effect can always be produced by using a sufficiently large tail plane and elevator. If the moment of inertia of the aeroplane is large, and the tail not quite great enough, the phugoid oscillation increases its amplitude, and the aeroplane will rise and fall in a wave of increasing height, ultimately striking the ground awkwardly. It has been contended in France that this motion is so slow that the pilot is not troubled by it, but it cannot be too strongly insisted upon that phugoid instability is undesirable as throwing a quite needless strain upon the pilot.

Figs. 3 and 4 give a general idea of the models which will be used to illustrate longitudinal stability calculations.

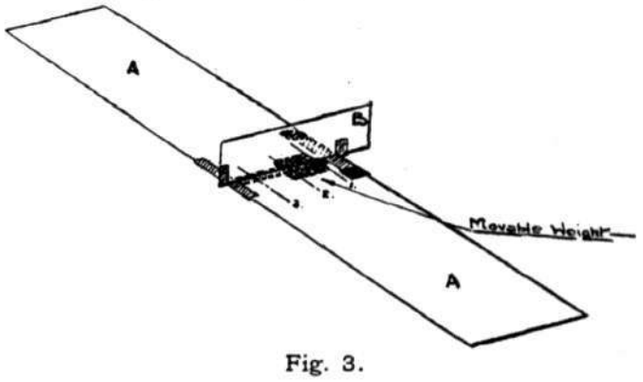


Fig. 3.

The first model is only a little different from that used to illustrate catastrophic instability, and consists essentially of a loaded mica plane. A movable weight allows a certain amount of adjustment of the position of the centre of gravity.

With the centre of gravity well forward, *i.e.*, one-third of the chord from the front, the flight of the model is stable, and only a damped phugoid can be detected in the motion. With the centre of gravity a little further back, the rapid oscillation can be seen to be superposed on the slower phugoid. This rapid oscillation is not readily seen from all positions. If the centre of gravity is moved still further back until it is in the centre of the chord, the model turns over and over backwards and glides down at a steep angle.

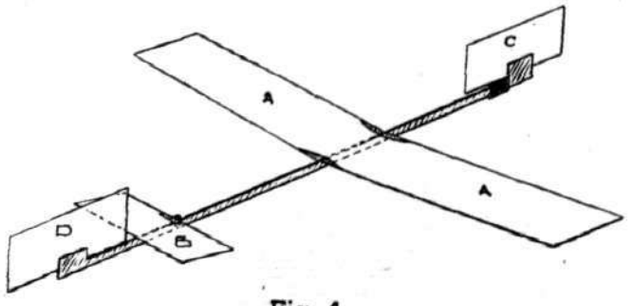


Fig. 4.

To show the unstable phugoid oscillation the model illustrated in Fig. 4 will be used. It differs from the weighted mica plane in its

greater moment of inertia, and an elevator plane is necessary to produce stability. At a certain inclination of the elevator plane the model becomes unstable, and the model shows the increasing wave, which is the first indication of longitudinal instability. A further decrease in the inclination of the elevator plane would produce a steady nose dive.

Longitudinal stability is not difficult to secure, and is generally identified with the principle of the upward Vee. Only one organ, the tail plane, need be altered to produce stability, and the principle of the upward Vee is expressed by the statement that (independently of their relative size) the forward plane shall be more heavily loaded per square foot than the rear plane.

Inherent longitudinal stability tends to maintenance of speed, and a stable machine must settle down to a definite speed for each setting of the elevator. Shutting off the engine without adjustment of controls has little effect on the steady speed, the additional power being obtained from a fall under the influence of gravity. The change from horizontal to gliding flight with the engine stopped usually only involves a speed variation of about 1 per cent. when the resulting phugoid has been damped out.

Lateral Stability.—Lateral stability appears to be more difficult to obtain than longitudinal stability, and the disturbed motions are of a different character. One of the motions is essentially dead-beat in any heavier than air machine. The motion is so rapid and transient that a model in actual flight cannot be used for a demonstration. The salient features can, however, be easily understood without such assistance. If we imagine that this model of an aeroplane is given a rolling motion when in flight by a quick outward and return motion of a miniature warp lever, then the subsequent motion will be as follows:—The right wing is rising and consequently the air strikes it at a reduced angle of incidence and the lift on it is reduced. Conversely the lift on the left and downward moving wing is increased, and the combined effect of the two forces is to introduce a powerful couple tending to stop the rolling. The rolling ceases with enormous rapidity, and is practically over in a fraction of a second. The rolling motion, however, simply stops, and the couple described does not restore the machine to an even keel. This restoration takes place in consequence of secondary actions introduced by side-slipping under the influence of gravity.

Motion which becomes a Spiral Glide when Unstable (Spiral Instability).—This motion can be illustrated by a model, and is one of the motions which may be dead-beat. Unlike the rolling described above, the disturbance may increase progressively instead of decreasing, and is dependent on, and controlled by, the earth's attraction. Spiral instability arises from the use of too large a rudder, and it is the proportioning of the rudder and vertical fin system generally which presents the most difficult of stability problems. If the machine is unstable, then on taking a turn to the right, side-slipping occurs inwards to the right after a preliminary outward movement under the action of centrifugal force. The machine then overbanks, and the rate of turning is increased. This goes on with increasing rapidity unless checked by the pilot. There exists a limit to the rate at which an aeroplane may increase its banking, but as this only means a period of 15 secs. before the machine becomes uncontrollable, the limit is higher than practical considerations would show to be desirable.

The spirally unstable motion will be shown with a model of the type illustrated in Fig. 4. The elevator will be put in a position which ensures longitudinal stability. The removal of the front pin is usually sufficient to produce the instability.

Oscillation.—The lateral oscillations of an aeroplane are of peculiar importance, as it follows from a study of them that "the most stable aeroplane is one which has for one of its types of lateral motion an oscillation." The statement does not go so far as to say that a machine which oscillates is stable, and a model will be flown which will show that such a statement would be wrong; it does, however, mean that a machine which does not oscillate has one of its stability factors small.

The oscillation becomes unstable when the rudder is not large enough, and thus a limit is obtained opposite to that of spiral instability, which arises from the use of too large a rudder. Starting with a stable aeroplane and reducing the rudder more and more has the effect of making the oscillations more and more apparent, until finally they tend to increase in size from one wave to the next. The model slide-slips and turns, keeping on an averagely straight course, but with increasing banking until it either loses speed and falls or overturns. With sufficient room beneath it an aeroplane would recover, but only to begin again an increasing oscillation. The model used to illustrate this type of instability has two fins of approximately equal areas.

If the rudder is still further reduced, the front fin becomes the larger and the unstable oscillation gives place to an instability of a very different kind. The model spins round about a vertical axis with great rapidity, loses all its forward speed and falls. From the inversion arising from this type of instability it is unlikely that a model would ever recover, no matter what the height of fall.

Other types of lateral instability are known, but the more important types have now been described.

The Important Features of an Aeroplane with respect to Lateral Stability.—The vertical fin system on which lateral stability depends is provided by the side surface of the body, the rudder and the dihedral angle or equivalent vertical fin above the centre of gravity. If a machine is spirally unstable the instability may be removed by deepening the body forward of the centre of gravity, or by increasing the dihedral angle. If the unstable oscillation appears the rudder area should be increased.

All full-scale experiments should, however, be carried out tentatively, as the inter-relation between the effect of the rudder and the dihedral angle, in order to produce stability, are not very simple. An aeroplane may be made unstable by increasing the dihedral angle unless the other factors in the stability equations are correspondingly changed.

If carried out with the necessary care (and there is no obvious royal road to success), it is quite certain that any aeroplane whatever which is capable of lifting its load, with some reserve of engine power, can be made laterally stable by attention to this vertical fin system. The details of the resulting motion will depend on the particular way in which the aeroplane is made, but stability in itself does not impose conditions so rigorous that a designer has not ample room for the exercise of his ingenuity for the improvement of efficiency, comfort, &c.

No attempt has been made to discuss the relative merits or demerits of "inherent" as against "automatic" stability. The reasons for this are twofold. In the first place automatic stability is not yet sufficiently developed either practically or theoretically; and secondly, there appears to be room for the development of both systems for use in the same aeroplane but for producing complementary effects. The only reason for the greater attention given to "inherent" stability is that the subject is better known to the author, and it appears to him that the mathematical analysis offers suggestions for immediate improvement in the stability of aeroplanes.

A Borel hydro-aeroplane getting under way.

FOREIGN AIRCRAFT NEWS.

The Michelin Target Prizes.

AT a meeting of the judges of the Michelin Target Contest, held at the Aero Club of France last week, it was decided to award the first prize of 15,000 francs to Fourny and the second prize of 5,000 francs to Gaubert. The third and fourth prizes were not awarded.

Ae.C.F. Prizes Awarded.

AT a meeting of the Aviation Committee of the Aero Club of France last week, the Criterium d'Aviation was definitely awarded to Seguin for his non-stop flight of 1,021·2 kiloms. from Paris to Bordeaux and back, while the Coupe Femina was definitely awarded to Madame de Laroche for her flight of 323 kiloms.

Another Prize Offered by the Seine General Council.

FOLLOWING on the offer to the L.N.A. of a prize of £400 for a race between Paris and some other European capital, the Paris General Council has offered another prize of £200 for a flight over one of "great aerial routes of the world," starting from Paris.

A New Military Nieuport.

ON Saturday last, at Villacoublay, Dr. Espanet was testing a new military Nieuport monoplane, which is not only fitted with a quick-firing gun, but is also armoured and designed specially for fighting airships.

Testing a Voisin Biplane.

AT Mourmelon on Saturday morning, Rugere was testing a Voisin biplane fitted with a Rhone motor, and climbed 500 metres in 5 min. 20 secs., while 1,000 metres were attained in 12 min. 30 secs.

A Security Competition.

THE competition for safety devices for flying machines, organised by the Union pour la Securite en Aeroplane has drawn 56 entries, and included among them are the de Beer monoplane, Blériot monoplane, Caudron biplane, Doutre stabiliser, R.E.P. machine (automatically stable longitudinally), Eteve stabiliser, Etrich monoplane, Dunne biplane, Moreau monoplane, Robiola machine, Schmidt biplane.

Looping with the "Parasol."

ON the Morane-Saulnier Parasol, with Rhone engine and Integral propeller, on which he had flown on the previous day from Villacoublay, Gilbert on the 14th made several flights at Mourmelon. In one he went up to a thousand metres in five minutes, and then made several loops.

M. Saulnier Loops the Loop.

M. SAULNIER, the designer of the Morane-Saulnier machine, on Saturday enjoyed the experience of looping the loop as a passenger with Gilbert on the Morane-Saulnier Parasol at Villacoublay.

Fast Flying on the Parasol.

AFTER his flight from Paris to Mourmelon on the Morane-Saulnier Parasol in an hour and five minutes, Gilbert returned to Villacoublay in an hour and a quarter on the following day. He flew on the 13th inst. from Villacoublay to Epernay and Mourmelon in two hours.

A Cold Trip to Bordeaux.

ON Saturday, Guillaux, on a Morane-Saulnier, started from Villacoublay at 3.30 p.m. with a view to making a non-stop flight to Bordeaux. He, however, had to come down owing to the cold at Chatellerault. On Sunday morning he made an attempt to get on, but was compelled to descend again owing to the mist at Montlieu, just before reaching Bordeaux.

New Loopers.

A NEW exponent of looping the loop appeared at Buc on the 15th, Montmain carrying out the manœuvre on a Blériot. After practising for some time he intends to attempt to loop the loop on his old love—a biplane. On Monday Deroye and Bidot carried out the manœuvres at the Blériot School, while Pecquet did it on a Morane at Villacoublay.

Naming Streets After Aviators.

THE Paris Municipal Council has decided to perpetuate the names of several more men who have given their lives in connection with aeronautics by giving their names to certain streets. Capt. Ferber, Capt. Marchal, and Adjt. Reaux (the last two being the officers who met their death in the "Republique" disaster), and Geo. Chavez are among the names it is proposed to honour in this way.

M. Blériot After Municipal Honours.

IT is not unlikely that M. Blériot will shortly seek election to the Seine General Council to represent the Southern Ward of Versailles.

A Challenge by Hamel Accepted.

THE challenge issued by Hamel to any aviator in the world to reproduce his flights has drawn replies from Galtier, one of the Caudron pilots, Garros, Audemars and Friedrich, all of whom have expressed their readiness to meet Hamel. It is stated that arrangements will probably be made for Garros to fly against Hamel in a match for £500 a-side, the match to consist of two speed tests and one of speed and landing combined.

Aeroplanes for Music Hall Artists.

MR. T. ELDER HEARN, who commenced to learn to fly at the Blériot School, Hendon, is now finishing off his education at Buc. It is announced that it is his intention in future, whenever possible, to fly from place to place to fulfil his engagements.

Testing the New F.B.A. Flying Boat.

IN Vernon Bay on the 16th inst., Burri made several tests with the new F.B.A. flying boat which was shown at the last Paris Show, the machine leaving the water in less than 30 metres. Afterwards Lieut. Hoeck of the Danish Navy flew the machine for a short trial.

Vedrines as a Jockey.

ON Sunday last Vedrines flew from the Pyramids to Heliopolis, where horse-racing was in progress. He then won a three furlong horse-race against Digby, a prominent Egyptian jockey, and flew back on his aeroplane to his quarters at the Pyramids.

Seaplanes for Norway.

INCLUDED in the Norwegian naval estimates is the sum of 80,000 kroner for the purchase of two hydro-aeroplanes.

Servian Army and Aviation.

IT is announced from Belgrade that the Servian Government has nominated ten officers and non-commissioned officers of the army to proceed to France to be trained as pilots and then return to Servia to form a flying school.

Long Cruises by "Sachsen."

THE Zeppelin "Sachsen," now stationed at Fuhlsbuttel, has made several long cruises recently. On the 14th during a 6-hour voyage, she went to the Danish border, then over the Baltic, and returned via Fehmarn and Kiel. The next day a 7-hour voyage was made by Wismar, Rostock, Giedser, Travsmunde and Lubeck.

MM. Vedrines and Marc Pourpe at Heliopolis about five minutes before Pourpe (on right in his flying kit) left there for Khartoum.

Models

Edited by V. E. JOHNSON, M.A.

The Collins-Hancock Monoplane.

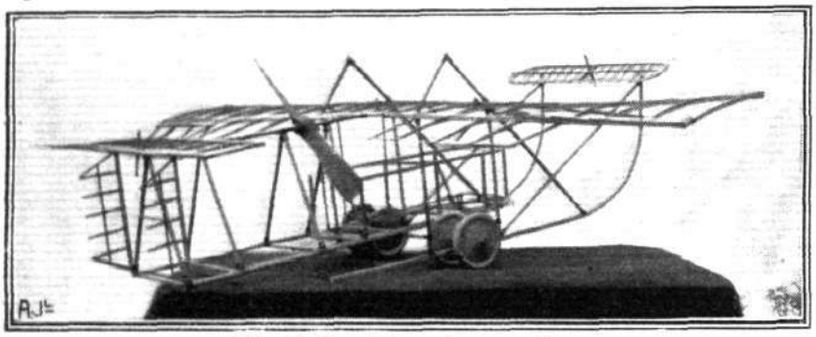
THIS machine was designed especially as a military scout.

It can be easily dissembled for road transport, the wings folding against the front skids, thus making the overall dimensions 20 ft. by 7 ft.

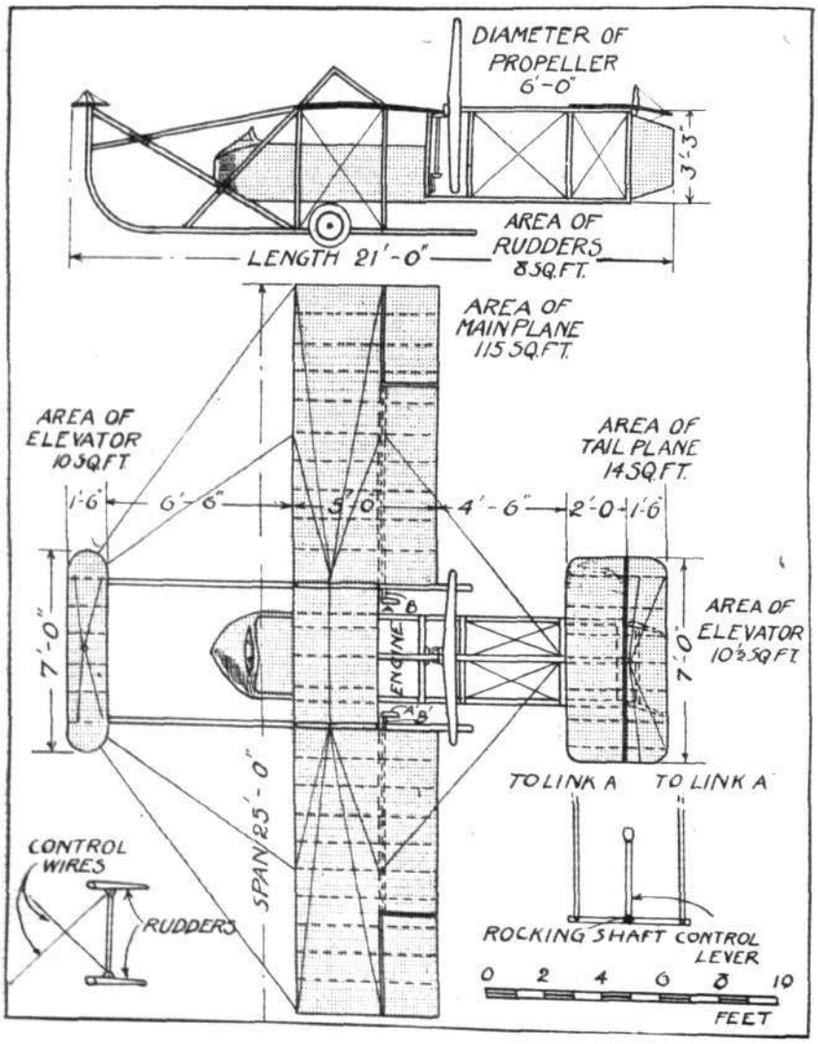
If necessary, the *fuselage* and *nacelle*, which are built up together, can be detached and fitted *nacelle* first in between the front skids, the tail plane and elevator being hung under the front elevator, thus reducing the length to approximately 15 ft.

The only controls which would need attention are the front elevator and *ailerons*.

The *ailerons* are controlled by rods and links, being absolutely rigid.



The Collins-Hancock monoplane.



Referring to the drawing, the *ailerons* are hinged on to rods, B and B^1, which are fixed inside the planes, so that they can revolve freely. These rods have links, A and A^1, attached at their inside ends, which are connected to a rocking bar inside the *nacelle*, which rocks up or down according to the movement of the control lever.

When the rocking bar is working, it pushes link A up and pulls link A^1 down, or *vice versa*, thus revolving the rods B and B^1 in opposite directions, so that one *aileron* attains a positive and the other a negative angle of incidence.

The propeller revolves on the top member of the triangular *fuselage*, and is driven by bevel gears.

The twin rudders are connected together by a rod, the control wires being taken from the ends of the rod.

The pilot has a clear view below.

It is essentially a speed machine, and will land at high speeds, but the landing chassis is one which has been proved satisfactory for large and heavy machines, so should be amply strong for this machine.

—A.L.C.

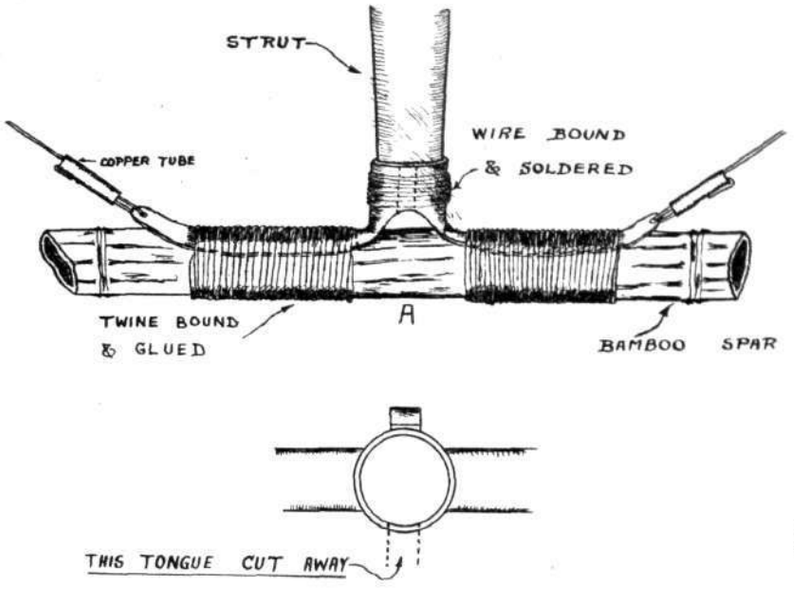
An Electrically-Driven Model.

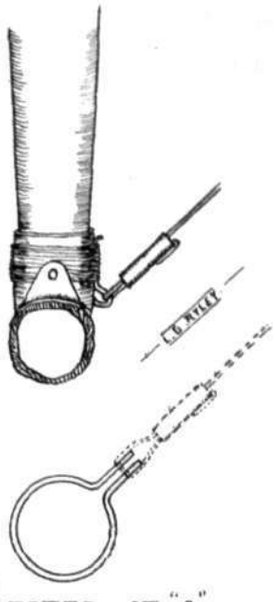
By H. RAMSEY KERRUISH.

I have lately been experimenting with a model driven by an electric motor and carrying its own batteries. It weighs inclusive 9½ ozs. It has an area of 3½ sq. ft. The thrust (static) given is 2 oz., which is just sufficient to fly it, leaving hardly any reserve of power. The chief dimensions are: Span, 4 ft. 6 ins., chord, 9 ins., overall length, 2 ft. 11 ins. Elevator, span 18 ins., chord 4 ins. The propeller, 14 ins. in diameter and 10 ins. pitch. The complete weight of the plant is 5·5 ozs., and of the model, 4 ozs. It is very lightly built, but nevertheless it is quite strong. It flies at 7·5 m.p.h. in a dead calm, but will not fly in any wind. The power plant is made up of a common tri-motor [tripolar-motor?] specially wound and carefully lightened, driven by six small cells constructed somewhat on the lines of the Delarue silver chloride cell, but embodying certain alterations which I do not wish to make public at present. The thrust of 2 oz. mentioned above is given off by the plant for a period of about one and a half minutes. I have cut down weight in every possible way, using carpet thread soaked in glue for bracing [Japanese silk gut would have been preferable.—V.E.J.] instead of wire, and covering the planes with the lightest chiffon doped with the thinnest solution sufficient for coherency. The model has flown quite well in suitable weather. The only place I have actually flown it in has been in the road opposite my house after dark, when little traffic is about, enough light to do so being afforded by the gas lamps. I start it off in the middle of the road and keep up with it by running, which is possible owing to its slow speed. As it has such a small reserve of power, it only rises about 4 ft. high, but keeps fairly consistently at that height, so that I am able to keep it going in the direction I wish by lightly pushing the front to one side or the other. On one occasion, the only one on which I made any measurements, I steered it down the road in this manner for a distance of 152 yards, the flight then only finishing owing to a connection working loose.

The general length of flight is considerably more than this, about 250 yards or so. It does a fairly good duration owing to its slow speed, but I have never actually timed it. It finished its career in a rather remarkable manner. I determined to be up-to-date, and make it loop the loop. I therefore fitted a 10 in. screw of 6 in. pitch, which ran at a tremendous speed when the cells were fully charged, but only lasted a short time. I then fitted a large vertical fin under the main planes, to prevent the unbalanced torque of the rotary propeller turning the machine over when at the top of the loop, and over-elevated. I placed the model on

the ground, switched on and let go. The result was instructive. As the *Petit Journal* said of Chanteloup, "vehemently he buckles the buckle, and then flies, his head *en bas*." The model rushed off the ground, flew up to about 15 ft., and then buckled the buckle successfully, to the edification of a few spectators. Now, I had made a serious mistake. After the loop I should have caught it, since there was no pilot on board to flatten out. But I left it alone, with the result that it made a second loop at a much lower altitude, and then, diving for a third, encountered Mother Earth, and alas, unlike Antæus, did *not* arise refreshed. I told the model my opinion of it, likening it unto off-scourings and such-like evil things, and then proceeded to pick up the bits. The motor and cells, most fortunately, had escaped injury; but the propeller was smashed, but not the main planes, since the bracing had snapped, letting them down gently. I have gained most valuable experience and data from this model, and am about to utilise the planes and power plant in the construction of a tractor monoplane.





THE AUTHOR'S LUG

Some Remarks on Gliders. By L. G. RYLEY (Coventry Aero Club.)

The various drawings and descriptions of man-carrying gliders which have appeared in the last few issues of FLIGHT are distinctly interesting, and I am pleased to see that several model clubs are thinking of including a full-sized gliding plane on their programme. Before writing further, allow me to thank the Editor, Mr. H. F. McManus and Mr. S. Camm for their businesslike replies to my query regarding the doping of unbleached calico. Returning to the subject, I notice Mr. W. Davies advises the use of bamboo for the spars, ribs and outrigger owing to the springiness of this ready-grown spar. Commenting on the above, this is rather encouraging, as the writer's biplane complies with the above specification, and he was anxious to know how this material would "stand up to its work." With regard to the lug used by the Birmingham Aero Club (FLIGHT, December 13th, 1913), the writer uses one similar to this, but with three "ears" instead of two as shown in the sketch. Whether this extra "ear" will stand the strain imposed upon it is a matter which can only be decided by the actual trial, but a number of clips are being made which can easily be inserted at A (*see* sketch), should the lug not "hold up."

It is easy to see, therefore, that even if a considerable number of lugs snapped, the time occupied in connecting several wires need not be more than 20 mins. at the very most. Mr. G. Haddon Wood remarks that the price paid for the covering was 3*d.* per yard, but the writer paid just double this price; the width was 40 ins. My machine (1-2-0 type) is more fortunate than some gliders, as it is at present stored (dismantled) in a conservatory attached to the house. Several "glidists" (I don't like that word much, do you?). [No, I don't.—V.E.J.] appear to have experienced some difficulty in the launching of a glider, *i.e.* the machine has to be hauled, tipped, &c., until the planes catch the wind, and then before the towers have realised what has happened, the machine has shot about 30 ft. into the air, as per "Haddon I." No doubt the pilot is anxious to "get aloft," and in his eagerness pulls excitedly at the control lever, with the above result.

With a view to overcoming (to some extent) the above difficulty, the writer has arranged on his glider for the control to be geared down. This might make the machine rather sluggish "on controls," but I think it will save a few of those dives and stalls that Mr. G. Haddon Wood speaks about.

KITE AND MODEL AEROPLANE ASSOCIATION.

Official Notices.

British Model Records.

Single screw, hand-launched	Duration	D. Driver...	...	85 secs.
Twin screw, do.	Distance	R. Lucas ...	...	590 yards.
	Duration	G. Hayden	...	137 secs.
Single screw, rise off ground	Distance	W. E. Evans	...	290 yards.
	Duration	W. E. Evans	...	64 secs.
Twin screw, do.	Distance	L. H. Slatter	...	365 yards.
	Duration	J. E. Louch	...	2 mins. 49 secs.
Single-tractor screw, hand-launched	Distance	C. C. Dutton	...	266 yards.
	Duration	J. E. Louch	...	91 secs.
Do., off-ground	Distance	C. C. Dutton	...	190 yards.
	Duration	J. E. Louch	...	94 secs.
Single screw hydro., off-water	Duration	L. H. Slatter	...	35 secs.
Single-tractor, do., do. ...	Duration	C. C. Dutton	...	29 secs.
Twin screw, do., do. ...	Duration	L. H. Slatter	...	60 secs.

Greeting.—The Toronto Model Aero Association, of Toronto, Canada, have sent warmest greetings to the Kite and Model Aeroplane Association and its affiliated clubs for 1914, trusting that the year will be rich in prosperity, progress and contentment in all aeronautical matters. A suitable greeting has been sent to our Canadian friends in reply.

Aero Show, Olympia.—The Wimbledon and District Model Aero Club have reserved a stand, increasing the clubs' stands to seven.

Gifts of Prizes.—The "Gnat" Aero-Models Co. of Hampton Wick and the Winithson Model Co. of Teddington have kindly offered prizes for competitions during 1914. The hon. sec. will be pleased to hear from any others interested in models who would like to offer prizes during the coming season.

International Kite and Model Aeroplane Meeting.—The proposed meeting not having met with the necessary support, will some gentleman who is interested in seeing England first in aviation and mistress of the air, come forward and subscribe the sum needed to hold this meeting during the coming season. Lord Montagu of Beaulieu has offered one trophy, four others are needed, besides £200 for cash prizes. The council therefore hope that some patriots will come forward and subscribe before the Aero Exhibition.

27, Victory Road, Wimbledon. W. H. AKEHURST, Hon. Sec.

AFFILIATED MODEL CLUBS DIARY.

CLUB reports of chief work done will be published monthly for the future. Secretaries' reports, to be included, must reach the Editor on the last Monday in each month.

Leytonstone and District Aero Club (64, LEYSPRING ROAD).

JAN. 25TH, model flying, 10 a.m., Wanstead Flats. If wet, meet at clubroom.

Sheffield Ae.C. (50, SPRINGHOUSE-RD., WALKLEY, SHEFFIELD).

JAN. 24TH, tractor contest postponed until further notice. Important announcement shortly.

Paddington and Districts (77, SWINDERBY ROAD, WEMBLEY).
JAN. 24TH, flying at Sudbury.

Wimbledon and District (165, HOLLAND ROAD, W.).
JAN. 24TH and 25th, flying as usual.

UNAFFILIATED CLUB.

S. Eastern Model Ae.C. (1, RAILWAY APPROACH, BROCKLEY).
JAN. 24TH, Woolwich Common, 3.30 p.m. until dusk. Jan. 25th, Blackheath, 7.30 to 10 a.m.; Lee Aerodrome, 10.30 a.m. to 12.30 p.m. The club's first indoor exhibition, to be held at the Central Hall, High Street, Peckham, next Thursday (Jan. 29th), will open at 7.30 p.m. Admission free. Members can gain admittance at 6 p.m. The promised exhibits include scale models of some of the most famous aeroplanes, also internal-combustion motors, a power model, several very interesting relicts of historic aircraft and numerous flying models and photographs. On Thursday, Feb. 5th, this exhibition will be re-opened at Ripon Road, Herbert Road, Woolwich. Visitors will be entitled to cast a vote for the most interesting exhibit, which will hold the "South Eastern Trophy" for the present quarter. Aeromodellists and their friends are heartily invited to attend. Trams and 'buses pass the Central Hall, which is near the junction of High Street, Peckham, with Rye Lane. "South Eastern Trophy" Competition.—Rules for third quarter (January-March), 1914: 1. This competition shall be open to members of the S.E.M.Ae.C. only, and is for 2. Models of either the tractor or propeller type capable of rising from the ground entirely under their own power, and of 3. Carrying a "dead" weight of not less than one ounce. 4. Models must not weigh more than eight ounces in complete flying order (excluding the "dead" weight carried). 5. The motive power may be elastic, clockwork or any other suitable means devised by the competitor. 6. The whole of the model, except wheels and propellers, must be constructed by the competitor. 7. The official flights will be timed on Saturdays, February 28th and March 28th. Competitors flying on the first mentioned date will be given an allowance of five per cent. on their marks. 8. Models will be required to start from *very short grass*, artificial surface will not be provided. 9. Models must alight on the chassis at the termination of one official flight and remain in a proper attitude for a minimum period of five minutes. 10. At the completion of their official flights models must be in an undamaged condition, unless the judges decide that such damage was caused by unfavourable weather conditions. 11. Competitors may change, repair or add to their motive power as often as necessary. 12. Models must be fitted with effective protectors. 13. Competitors pushing or otherwise assisting their models to rise will be disqualified. 14. The winner shall be the competitor who obtains the greatest number of marks, which will be awarded in the following manner: The duration of flight (in seconds) multiplied by the weight carried (in ounces). 15. If time permits three official flights will be allowed to each competitor on each or both of the dates. 16. Competitors must be responsible for all damage done by or to their models. 17. The judging committee shall consist of three non-competitors. 18. Each competitor may enter any number of models. 19. These rules may be amended or otherwise added to at the discretion of the judges. Entry forms must be sent to the hon. sec. at least three days previous to the official flying dates.

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CORRESPONDENCE.

Aircraft and the Government.

[1826] May I suggest that, in pursuance of the policy of strengthening the hands of the First Lord of the Admiralty put forward in your excellent leading article of January 10th, you publish as soon as possible the latest information available as to the relative strength in the air services of France, Germany, and ourselves, and the amount of money spent on these services during the last few years?

I see to-day, that a gentleman of the un-English name of Molteno has gravely asserted that we are three times as strong as Germany at sea! This person is surely the limit, and I will not insult the intelligence of your readers by correcting him. The fact that we have given up the command of the Mediterranean, to say nothing of the Pacific Ocean, shows how serious the position really is.

As one of your contributors hints in the same number, it would be a good deal better if our flying men turned their attention to long-distance flights and reconnaissance instead of amusing an idle populace, but as they get no inducement to do so, it is hardly to be expected that they should.

Would it not be possible to induce some of our wealthy men to finance a line of passenger airships which would be available in time of war?

Referring to your article, as to the aggressive use of aircraft, there can be little doubt that, even at the present moment, they would do their best to destroy, or at least disorganise, some of our dockyards, by night attacks of airships, and how they are to be warded off no one knows. However, that is too big a subject to go into here. I may remind you, too, that the French are openly organising their larger 'planes for "special missions," which is understood to mean the destruction of railway stations, and so on.

January 14th. R.A. (Retired).

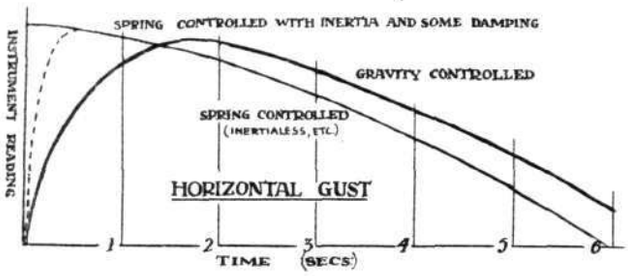
Speed Indicators.

[1827] Mr. Booth's article in your issue of January 3rd relating to gravity-controlled speed indicators raises several points of interest, and up to the present no one has attempted to defend the type. It would have been of still greater interest had pilots given their impressions of the behaviour of spring-controlled *versus* gravity-controlled speed indicators.

In the absence of such information, the discussion can only be continued on the lines indicated by Mr. Booth. It is common ground for advocates of either type of instrument that in steady flight each reads correctly the speed of the aeroplane through the air. Divergence of opinion begins when the behaviour of aeroplane instruments exposed to gusts is observed, and it is possible to agree with Mr. Booth's calculations and yet to totally disagree with his conclusions. Had the behaviour of the instruments been examined for vertical gusts instead of those in the direction of flight, it is probable that the gravity instrument would not have been looked upon with such suspicion.

Take, for example, the case of an aeroplane entering a downward air current. The speed through the air is not altered to an appreciable extent, and as a consequence the spring-controlled speed-indicator, which reads only the speed through the air, makes only a feeble and insignificant response to a vertical gust. The aeroplane, however, immediately gets a downward acceleration and gives a reading.

If the argument were left at this point it might be concluded that a spring-controlled air speed indicator gives warning of horizontal



gusts and not of vertical gusts, and that a gravity-controlled instrument gives warning of vertical gusts and ignores changes of forward speed relative to the wind.

The arguments as given above are incomplete, because, as in Mr. Booth's case, the behaviour of the instruments is only considered for the instant at which the aeroplane receives the gust. It is an essential part of the assumptions underlying such calculations that the aeroplane shall not have had time to respond to the gusts.

The writer has had occasion, in connection with calculations relating to the stability of aeroplanes, to consider the response of a flying machine to gusts, and it is easy to estimate from these calculations the general nature of the readings of the instruments for a few seconds after the aeroplane has encountered the gust. The curves in the figure illustrate the conclusions.

An instantaneous reading such as was indicated by the incomplete calculations could only be obtained on a weightless and frictionless apparatus. The dotted curve probably most nearly represents the general curve.

For a vertical gust the curves would be interchanged. After a period which may be from half to one second, both instruments would be indicating substantially the same thing, but the spring-controlled instrument will be rather quicker than a gravity controlled indicator in its response to a horizontal gust and slower in response to a vertical gust.

There does not appear to be anything in principle which favours one instrument more than the other, and for this reason the writer is unable to appreciate the necessity for "A Warning to Pilots" on the basis of Mr. Booth's calculations.

LEONARD BAIRSTOW.

The National Physical Laboratory, Teddington.

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